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ABSTRACT

Based on the economic theory of constrained maximizing behavior, this paper constructs a model of decision-making in public schools in order to discuss the role of unions and collective bargaining in resource allocation decisions. Research findings from a study of collective bargaining in New York and Michigan school districts indicate that collective bargaining does have a significant impact on the allocation of resources in ways that affect student learning. The positive effects of collective bargaining include giving teachers a greater stake in the negotiated decisions of a district, reducing teacher turnover, encouraging the entry into the profession of more qualified teachers, and possibly increasing productive teacher attributes that have been related to higher student achievement. The authors state that future investigations should include an exploration of the linkages outlined in this paper at the classroom or individual level. (Author/WD)

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THE EFFECTS OF COLLECTIVE BARGAINING IN PUBLIC SCHOOLS

BY

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CHAPTER 1. INTRODUCTION

This report summarizes a year-long project to empirically examine the effects of collective bargaining in public schools. The study goes considerably further than any other study with which we are familiar in actually measuring how collective bargaining affects the organization and performance of public schools. The results should be of interest to many educators and educational decision makers at all levels of government, as well as to teacher organizations and district negotiations staffs. Finally, the methodology employed in this study should help other researchers study the effects of institutional innovations on public services.

The best way to introduce this study is to begin with a brief survey of the existing literature on collective bargaining in the public sector. Over the past ten years scholars have produced an abundant literature on public sector collective bargaining. Much of the work has described or theorized about the nature of the bargaining relationship. A smaller body of empirical work has examined the effects of unionization on wages and benefits. A few studies have focused on the determinants of bargaining outcomes and general trends in collective bargaining practices. There has been almost no work which attempts to empirically test formal propositions about the impact of collective bargaining on schools and students.

Theoretical Literature

There are two broad areas of theoretical literature on public sector collective bargaining. The first addresses the normative question, what should be the relationship between management and labor in the public sector? The second addresses the positive question, "What is the nature

of the bargaining relationship under collective bargaining?"

The normative literature usually evolves from an assertion that there is a principle which must be given precedence in establishing a relationship between management and labor. For example, Robert Summers postulates that democracy must be protected at all costs and argues that collective bargaining in the public sector diminishes democracy by delegating to a private third party, the collective bargaining committee, decisions that were previously made by an elected public body.[1] While acknowledging that collective bargaining may improve management-labor relations, he says that is not important enough to justify a weakening of our democratic institutions.

A more typical critique of public sector bargaining stems from the notion that collective bargaining gives unions "disproportionate power" in the management-labor relationship. The initiators of this line of reasoning are Wellington and Winter."[2] Unlike Summers, they are not concerned that unionization in the public sector may be anti-democratic. Their concern is the effects that union power may have on the efficient provision of public services. The logic is primarily an economic one. Unionization constrains competition in the public employee labor market. Wages and benefits are set, not by the supply and demand of qualified teaching personnel, but by negotiators faced with the threat of labor unrest or service curtailment. In the private sector collective bargaining poses less of a threat to efficiency, because both labor and management are constrained by the marketplace. Labor's demands are constrained by the fear that increased wages may raise a firm's prices to uncompetitive levels and lead to the lay-off of employees. Management is constrained in agreeing to higher salaries by the fear of a profit reduction and

possible bankruptcy. Neither management nor labor is so constrained in public sector negotiations. Management can often pass increased costs onto taxpayers and many public employees discount the threat of layoffs because of the essential nature of public services. Disproportionate union power, it is argued, increases the costs of public services and has the potential to reduce either the quantity or quality of services provided.

Political scientists have given attention to the same theme in examining the desirability of public sector bargaining.[3] For them the relative power of various political actors determines the distribution of the costs and benefits of public services. Most political scientists argue that the public interest is served best when access and power in the political process are broadly distributed. Unionization of public employees has increased labor's power by giving unions a law-making role in decisions affecting wages and working conditions, and by creating a powerful interest group capable of influencing legislation through campaign activities and lobbying. The question is whether unions now have enough or too much power in the political process. This question leads to speculation about the kinds of institutional arrangements that produce the appropriate balance of power among competing political interests. To the extent that unions are found to have "disproportionate power," recommendations are made to either reduce union power or enhance the power of public managers or the consumers of public services.[4]

The second strand of theoretical literature on public sector collective bargaining examines the nature of the bargaining relationship.[5] The antecedents of this work are more varied and frequently evolve from an

extensive body of literature on collective bargaining in the private sector. The principal concern is to understand how collective bargaining modifies the relationship between management and labor which existed in the absence of collective bargaining. A good analogy is the comparison that is made between pricing and production decisions on pure competition and under various forms of imperfect competition. This literature asks how the contractural arrangements between management and labor in an individualistic labor market are modified by the negotiation of a collective bargaining contract. We will come back to this literature in Chapter 2 when we describe the union role in educational decision making.

Empirical Literature

Empirical studies of public sector collective bargaining are limited. In the area of public education, most of the quantitative studies have attempted to examine the effect of unionization on teachers' salaries and fringe benefits.[6] The usual procedure is to compare increases in teacher's salaries in districts that bargain collectively with those in districts that do not. Contrary to conventional public perception, most of the studies show that unionization increases only slightly the wages and benefits of teachers. With the exception of Chambers' results, the other studies support Kasper's original estimates of differences that range from 0 to 4 percent. Only Chambers' estimates show a consistently higher impact of bargaining, an average 7.5 percent increase in unified districts and 16.8 percent in elementary districts. The higher estimates result from his taking into account both district and regional effects of bargaining. Chambers also found that administrator salaries increase as a result of bargaining along with teachers' salaries but at a somewhat lower

rate.[7] While there is still disagreement on the size of the unionization effect on wages, the literature supports the conclusion that the impacts are not large and are concentrated in the early years of bargaining.

More recently, researchers have begun to examine the non-economic effects of collective bargaining in public education and other public service areas. Much of this work relies on the analysis of collective bargaining agreements, case studies, and the experience of the researchers. McDonnell and Pascal examined both the determinants of bargaining agreements and trends in bargaining behavior.[8] They found that state collective bargaining laws and the length of the bargaining relationship were important determinants of the bargaining agreement. Contracts reflect concern of unions for wages and fringe benefits, working conditions and job security, and issues of educational policy in that order of priority. With respect to trends in collective bargaining, McDonnell and Pascal found that unions use political pressure as well as collective bargaining to pursue their objectives. They noted that no single impasse procedure is more effective than all others; that school board members avoid negotiations; and that principals are largely responsible for contract administration. Finally, they downplay the consequences of collective bargaining on the educational process itself.

> We found that students experience the effects of bargaining only indirectly and occasionally. They may attend somewhat smaller classes, but for fewer hours per day and fewer days per year. Rising personnel costs may result in less supplementary learning resources for students, but at the same time teachers may be happier and aides and specialists more plentiful. An older and more highly credentialed teacher source may mean more expertise in instruction, but perhaps less flexibility and energy. How any of these consequences of collective bargaining influence the rate of learning or other student interests remains largely unknown.[9]

Perry examined a decade of experience with collective bargaining of nine school districts and reached the following conclusions: Collective bargaining in public education is not radically different in process and results from collective bargaining in the private sector.[10] Political constraints on collective bargaining are weak and diffuse. The primary burden of disciplining negotiators has fallen to the fiscal constraints facing many school district. Perry concludes that the primary effect of collective bargaining has been to improve the salaries and working conditions of teachers. Teachers have forced taxpayers in districts to pay them more for their services. Working conditions have been improved by a lowering of the teacher/pupil ratio. Teachers have gained job rights in the form of protection from arbitrary treatment and a role in educational decision making.

A final example of research on the bargaining process is Kirschner's work on the impact of collective bargaining on school governance.[11] He concludes that collective bargaining has produced a multilateral, or at least a bilateral, system of decision making, has brought new participants into educational decision making, has moved the locus of decision making to locations outside of school systems, especially to state legislatures and the courts, has broadened the scope of issues in labor relations debates, and has changed the nature of managerial work in schools.

The principal focus of empirical research on collective bargaining in education has been on the wage and process consequences of collective bargaining. Almost nothing has been written on the effects of collective bargaining on the allocation of resources in school and the consequence of resource changes on the educational attainment of school children. We attempt to fill this gap by providing an argument as to why

collective bargaining can be expected to result in decisions which change the use of school resources. We then test that argument with data from 1336 school districts in New York and Michigan.

Description of Study

This study, The Effects of Collective Bargaining in Public Schools, analyzes the impact of collective bargaining on decisions likes to affect the educational process and ultimately the achievement of school children. Chapter 2 presents a theoretical argument as to why collective bargaining is likely to affect resource allocation decisions in public education. The argument rests on the observation that unions represent a different set of teacher preferences about wages and working conditions than is considered by management in the absence of collective bargaining. Without collective bargaining, management pays primary attention to the preferences of those teachers who are likely to quit if their wage and working condition demands are unmet. These tend to be beginning, younger teachers for whom the cost of changing jobs is not high. Unions represent the interests of the majority of teachers as reflected by the preference of the median teacher. Since the median teacher is older, more experienced, and likely to be tied to the job by family responsibilities, the union will represent a different set of preferences than those of the marginal teachers previously considered by management. The distinction between younger (marginal) teachers and older (inframarginal) teachers leads us to develop, in the last part of Chapter 2, a number of testable hypotheses.

Chapter 3 outlines the methodology used to test the hypotheses presented in Chapter 2. It begins with a specification of a formal model. It then describes the econometric techniques used to test various relationships which are studied in subsequent chapters. This methodological

chapter will be of interest to researchers but may be skipped by those more interested in our findings.

Chapter 4 and 5 present our research findings. Chapter 4 examines the impact of collective bargaining in New York school district. Chapter 5 does the same for Michigan school districts. Each chapter begins with a description of the state's collective bargaining law and presents basic information about enrollment, fiscal, and educational trends in the state.

In order to establish a baseline from which to analyze the affects of collective bargaining in the two states, we begin our discsussion with an analysis of how six environmental variables affect the allocation of resources among important budget categories. More specifically, the independent variables are total operating expenditures per pupil, student enrollment, student enrollment squared, percent of families on welfare, the dropout rate, and the percent of parents with college educations. The dependent variables are instructional expenditures per pupil, administrative expenditures per pupil, employee benefits per pupil, total teachers salaries per pupil, teacher-student ratio, average salary of teachers, the percentage of teachers with masters degrees, and the average years experience of teachers. The results of the regression analysis then become the basis for identifying the independent effects of unionization and specific contract items.

Three different methods are used to enter union variables into the analysis. First we enter unions as a dichotomous variable to see what effects the presence of unions have on the dependent variable mentioned above. Next we analyze the effects of the total number of contract items on resource allocation decisions. The total number of contract items is important because it reflects not only the maturity of the bargaining

relationship but also the degree to which districts are constrained from substituting other provisions for the one being limited by the contract. Finally, we examine the relationships between individual contract items and the dependent resource allocation items.

We identify six variables which affect teacher effectiveness. They are the union contract items, teacher qualifications, the teacher/pupil ratio, the size of the district, the percent of parents with college educations, and student characteristics. In New York state we are also able to examine modes of instruction and methods of instruction as they relate to changes in student achievement.

The final chapter, Chapter 6, summarizes the results of the study. In general we have found that collective bargaining significantly affects the allocation of resources in school districts in ways that are likely to have an important impact of the learning of students. Many of the linkages between contract provisions and resource allocation, between contract provisions and teacher mobility, and between teacher attributes and student achievement are developed and the results reported. Many of the findings are significant and in the directions predicted by our theoretical model. The statement about the relationship between collective bargaining and student outcomes is qualified by the limitations of the data and our methodology. We have made important progress in showing how collective bargaining affects public education, yet are equally aware that much more needs to be done before the subject is exhausted.

Footnotes - Chapter 1

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9. McDonnel and Pascal, Organized Teachers in American Schools, p. xii.

10. Charles R. Perry, "Teacher Bargaining: The Experience in Nine Systems," Industrial and Labor Relations Review, Vol. 33, No. 1 (October, 1979), pp 3-17.

11. Charles T. Kerchner, "The Impact of Collective Bargaining on School Governance," Education and Urban Society, Vol. 11, No. 2 (February, 1979), pp 181-207.

CHAPTER 2

A THEORY OF THE UNION'S ROLE IN EDUCATIONAL DECISION MAKING

Introduction

The purpose of this study is to measure the impact of collective bargaining on the allocation of resources in school districts and on the achievement of school children. Before doing this we must address the fundamental question of why collective bargaining is likely to affect educational inputs and student outcomes? This chapter attempts to answer that question.

The answer to this question is, at one level, simple, but its implications are rather complex. Collective bargaining between management and labor will make a difference in resource allocation decisions and student achievement when teachers' preferences on such matters as salaries, fringe benefits, working conditions, and educational policy are considered and do not coincide with the preferences of the administration. On the first condition, collective bargaining statutes have given teachers a powerful voice in educational decision making. Most state laws require that management and teachers reach a mutually agreed upon decision on matters related to wages and working conditions. Compromise is essential which means that management must modify its position to accommodate the preferences of teachers. It is the second condition, which states that collective bargaining makes a difference when the preferences of managers and teachers do not coincide, that is more important and will be the focus of the following discussion.

Teacher Preferences and Educational Decision Making

Prior to collective bargaining, teachers expressed their preferences concerning wages and working conditions by their decisions to accept

employment or to look for employment some place else. If a teacher was dissatisfied with the salary and working conditions being offered by a district, he or she would quit and search for another organization whose compensation-working condition package better matched the individual's preference. Collective bargaining provides an alternative to the quit and search option. It provides employees with a forum to express dissatisfaciton and a vehicle to change existing conditions. Unions expand the single option of exit to the dual option of exit or voice.

Hirschman was the first to formalize the two options into an integrated theory of economic decision making.[1] Hirschman's theory has been recently applied to labor decisions by Freeman and Medoff.[2] We extend this basic model to explain why certain contract items will be observed to effect the allocation of educational resources and the achievement of students in different directions and magnitudes.

The first step in answering the question of why unions make a difference is to address the reasons for the differences in preferences between administrators and teachers. We will begin the discussion by describing the internal labor market of an organization, particularly why organizations choose to minimize staff turnovers. Second, we show how the distinction between marginal and inframarginal teachers leads to a labor force with heterogeneous preferences. Finally, we show that the extent to which unions alter the behavior of school administrators depends on a difference in preferences between marginal and inframarginal teachers.

Internal Labor Market for Teachers

In the economist's neoclassical world of perfectly competitive markets, firms are always assured of an adequate supply of homogeneous workers if

the firm is willing to pay the prevailing market-clearing wage rate. Turnover is no problem since any worker can be instantly replaced with an identical worker without loss of output and without additional costs for recruiting or training. This is obviously not the situation facing school administrators or any other employer. Uncontrollable elements influencing the acquisition of new workers and the retention of present employees makes it costly to maintain a work force. For example, management lacks information on the intentions of present employees to remain at work. At best management can estimate the average propensity of workers to quit. It seldom has information on which workers in which departments from which school might leave. The hiring process is subject to similar uncertainties. Teachers are faced with imperfect information about job openings and characteristics and the search costs limit the size of the applicant pool at any one time while screening costs and the time spent recruiting and interviewing applicants further lengthens the hiring process.

School districts are faced, therefore, with four types of personnel costs: 1) costs incurred in alternating and maintaining working conditions, 2) wage costs, 3) recruiting and screening costs, and 4) training costs. The first two costs are assumed to be proportional to the number of workers. Recruiting and screening costs are proportional to the number of vacancies. Training costs are incurred with each new hire.

Cost minimizing organizations, such as school districts, will seek to minimize its total labor costs by attempting to influence the turnover and accession rates. The quit rate is influenced by the wages and the quality of the workplace. An increase in wages will reduce the number of quits as will an increase in the quality of the working conditions. Thus,

the quit rate will vary inversely with the cost of wages and working conditions.

The hiring rate is affected by three factors: wages, recruiting expenditures, and the quality of working conditions. Higher wages increase the attractiveness of the district and increased expenditures on recruiting increases the number of potential applicants. The quit rate may serve as an indication of the quality of the working conditions for prospective employees.

Viscusi has determined the interrelationships between the four types of personnel costs and their effects on the turnover and accession rates.[3] He finds investments in workplace conditions productive for two reasons. First, they decrease turnover directly, and second, they exert an indirect effect on the hiring rate through the quit rate. The appropriate level of expenditures to improve the work environment depends on the amount of other expenditures, worker productivity and preferences, and the levels of hiring and quit rates. It is conceivable that in situations where training costs and recruiting costs are low, districts will find little incentive to invest heavily in the work environment. On the other hand, districts with high training and recruiting costs will seek to reduce quits by increasing wages of at least the marginal workers, and increasing investment in the working conditions. The mix of policies will depend upon the relative response of workers to wages and working conditions. If quits are reduced more by an increase in wages than by an increase in working conditions, then more of the personnel expenditures will be directed to wages. Furthermore, if the employer cannot identify the marginal worker, then because of the publicness of the working condition, the employer might be well advised to increase expenditures on the working

environment since the working environment is consumed by every worker.

The primary result of the discussion of internal labor markets is that employers are concerned under most situations about retaining the present work force. Circumstances can be imagined in which this may not be true such as the case when job specific skills are negligible (low training costs), job tasks are very similar and an ample supply of qualified workers are readily available. In this case, if seniority or other tenure related criteria have increased the wages of existing workers, the firm may seek to minimize personnel costs by trading more tenured, higher paid for less senior employees.

Marginal and Inframarginal Teachers

In most cases certain job specific tasks learned through experience, and the uncertainty of the potential replacement's true productivity provide incentive for a district to seek to retain its present teaching staff. However, the propensity of teachers to quit is not uniform among the teachers in the district. Teachers differ in their preferences. They prefer various combinations of wages, working conditions, fringe benefits, and job security. Also, their decision to quit and search for alternative employment may be unrelated to the workplace but may involve family or locational considerations. Therefore, it may behove the district to ignore the preferences of teachers who have little intention to quit, those who are not on the margin of quitting or staying, and concentrate primarily on the marginal teachers, those most likely to leave.

In order to explore the relationship between the marginal teacher (one who may quit or stay if an incremental change in the workplace occurs) and the inframarginal teacher (one who would need a much greater change in

working conditions to induce a decision to leave), we will examine three basic models of market power; the monopsonist model, a wage discriminator model and finally introduce the union within the bilateral monopoly model. The purpose of this exercise is to show the social benefits of considering not only the marginal groups when making allocation decisions but also the inframarginal groups as well.

In order to discuss the models of market power, we need to introduce the notion of both consumer and producer surplus. Teachers, as sellers of educational services, reap a surplus when any of the individuals receive higher compensation than would have been necessary to keep that individual employed in his or her present occupation.

The school district, as a purchaser of services, reaps a surplus when it pays less to the entire teaching staff than would result if everyone received the same wage. Clearly, when teachers receive a surplus, the surplus of the district diminishes and vice versa.

Monopsonist Model

The monopsonist model is well documented in economics literature and is most applicable to the position of public school districts in the local labor market since it is usually the single buyer of teacher services in the area. If the school district acts as a monopsonist and at the same time attempts to minimize its costs, its wage offer will attract only the marginal teacher and result in a suboptimal number of teachers employed. Maximization of the joint surpluses of the school district and the labor supply results in an optimal allocation of labor only if the valuation of the marginal teacher is the same as the average of the marginal valuations of all teachers, that is, if the preferences of all of the

teachers regarding wages and working conditions are identical. Thus, if teachers had identical preferences the school district, in order to retain the marginal teacher, would simultaneously meet the preferences of all teachers.

Wage Discrimination Model

Teachers' preferences differ, however. The obvious solution to the district's problem of retaining its work force would be for each teacher to reveal his or her true preferences with respect to working conditions and wages in order that the district may contract with each teacher individually to match exactly the teacher's reservation wage-working conditions-fringe benefits package. It is abvious what would happen in this situation. Teachers, who for various reasons prefer to remain within the district or who are approaching retirement, are less mobile than younger teachers and thus cannot command as high a reservation wage. Thus, the wage discriminator would need to pay only the wage that would keep each teacher with the school district, no more - no less. The district reaps the entire surplus and workers receive less than they would in the monopsonist case.

However, most school districts are unable to wage discriminate since they follow a uniform salary schedule in which wages are attached to jobs in the form of increments of experience and education and not to individuals. A uniform salary schedule has not always been the case. At the beginning of the century before teacher unions, teachers were paid according to merit as assessed by the principal. Through the increased voice of teacher associations and unions, this practice was gradually eliminated as teachers complained of its arbitrary and whimsical procedures.

Individual contracts between the district and teachers are not altogether unfeasible, however. Because of the uncertain events facing both sides, contingency contracts may be drawn up which, depending upon the outcomes of the events, may be more beneficial to one party than the other. If the outcome favors the teacher, then the teacher will receive a small share of the surplus that otherwise would have been claimed by the district.

Obviously, there is no incentive for teachers to reveal their true preferences since the outcome is probably a compensation package that is smaller than they otherwise would receive. Thus, even if the district could mystically devine the preferences of all the teachers, teachers would immediately be inclined to band together to claim a larger share of the total surplus.

Bilateral Monopoly Model

Teacher unions are formed to counter the power of the monopsonistic public school district. The bilateral monopoly model provides a suitable framework for examining the relationship between the school district, as the sole buyer of teacher services, and the union, as the sole seller of these same services. The objective of the union becomes clear from the discussion of the wage discrimination model. The union wishes to maximize teacher surplus (or benefits) as derived from wages, working conditions, fringe benefits, and the quantity of labor. Clearly, unions have pressed to gain concessions in these areas.[4]

The bilateral monopoly model produces a number of possible outcomes. If the union is weak, the outcome of bargaining may be equivalent to the monopsony case in which the school district claims the entire surplus leaving just enough for the union to claim it benefits teachers. If the

union is strong, the reverse may prevail in which the union reaps the entire surplus in the form of higher teacher salaries and improved working conditions, leaving few resources to be allocated at the discretion of district administrators. Both solutions are optimal in terms of the marginal worker, but neither one considers the preferences of the inframarginal worker expect under unusual circumstances. However, the element of market concentration can never raise the surplus value above that obtained if competitive outcomes prevailed, and it will usually result in suboptimal levels of working conditions. The cooperative solution will maximize the joint surplus of employer and employees as represented collectively. In this case, the optimal level of working conditions will be responsive to the preferences of inframarginal workers.

Union Effects on District Decisions

The distinction between the behavior of the district and the collective behavior of teachers rests with the difference between the marginal and inframarginal teachers. The district seeks to meet the preferences of the marginal teachers, and the union, through its majority rule decision-making process, seeks to meet the preferences of the inframarginal teachers. If the preferences of the two types of teachers are identical, then the decision of the two parties will coincide. If preferences differ, then the desired decisions will conflict and can only be resolved optimally under a cooperative solution hammered out at the bargaining table.

The divergence of the two decision sets (administrators and teachers) determines the propensity to bargain for particular items. Once it is decided to bargain for a particular item, the appearance of the item in the

contract will be the result of either union strength or the sacrifice of some other aspect of the bargaining agreemert. As union strength increases, less sacrifice on other items by the union is required.

Contract items appear in a contract in response to the fact that the district is not meeting the preferences of the collective group of teachers or as a contingency so that given a future event the preferences of the union will be met. Both conditions rely on the occurence of an event. In the first case the event has occurred and the consequences are presently being experienced. In the second case, the event has yet to occur (or maybe it has occurred before but at the moment is not present) but teachers may want to protect themselves against the consequences if the event occurs in the future.

Suppose that a particular item is placed in the contract in response to the combination of forces mentioned above (i.e., heterogeneous preferences and union strength). However, over time, the preferences of marginal teachers move closer to the preferences of inframarginal teachers, perhaps due to a common concern about external conditions. If the district still bases its decisions on the preferences of marginal teachers, then the observed union influence will not be as significant as it was at the time the contract was negotiated. If the district prefers an action which does not benefit any group of teachers (laying off teachers), then the coalition of all teachers may have a significant impact. However, in the face of financial exigency, the union may work harder to protect tenured teachers than non-tenured teachers. Thus, the impact of the contract item on resource allocation will be a function of the occurrence of an event and the distribution of preferences of teachers.

The reason that union strength is not considered as a factor is that the presence of a contract item presupposes that the union has sufficient bargaining strength to implement the item. Enforcement of the item is another matter, but we will assume the enforcement is not a major issue. In this framework of contingency contracts, it is possible that a contract item has no impact and may not have an impact until the event takes place. On the other hand, if the item is not a contingency item, and the item is responding to a current event, then in order for the article to be placed in the contract, there must exist a point of conflict on the related outcomes of the decision.

If we are correct in assuming that the district in the absence of a contract, meets the preferences of marginal teachers and there are substantial differences between teachers, then there exists the potential for a large degree of dissension within the teacher organization. The solidarity of the union will depend on the conditions under which teachers may feel marginal, that is, the conditions under which teachers feel that they may be able to find alternative employment which offers higher benefits than their current positions. Some obvious situations arise. In times of increasing enrollment and budget support, teachers may be optimistic about job prospects and will be more likely to move in response to poor working conditions. School districts, in trying to retain a qualified teaching staff, may be more likely (and capable) of meeting the marginal teachers' preferences. In this case, unions will be less likely to rally the teachers around the preferences of the inframarginal teachers. At the same time, the inframarginal teachers may be less in numbers and need a wider political coalition in which to voice their preferences within the teacher organization.

In times of declining enrollments and decreased school expenditures (in real terms), the opposite situation may occur. Teachers are less optimistic about alternative employment in other schools, districts can exert less effort to retain the teaching staff, and the inframarginal group of teachers will increase. Although districts may be less able to meet the demands of the teachers, the collective voice will be much greater.

We have shown that it is important to include the occurrence of an event in order to distinguish between situations in which contracts may or may not make a difference. It also can be shown that the distribution of teachers within the district may not need to be included explicitly in the analysis. If we include a variable to measure the presence of an event such as declining enrollments, then a satistically significant coefficient on the contract item will indicate that sufficient differences exist between administrators and teachers in order for the contract item to influence the allocation of resources. Leaving out a measure of teacher preferences, however, will not allow us to determine the reason behind the difference in decision sets. We have hypothesized that the difference is a result of the heterogeneity of teacher preferences and the desire of administrators to satisfy the marginal teachers. We may, however, find that under conditions such as declining enrollments, administrators would encourage departure of teachers and will not feel inclined to retain marginal teachers by improving their compensation or working conditions. On the other hand, teachers who are dissatisfied with the poor compensation package would have little recourse but to rely on the union to change the situation since job alternatives within the profession are very scarce. In this situation, almost every

teacher can be classified as inframarginal and the impact of the contract item on the allocation of resources will not depend upon the heterogeneity of teacher preferences.

To summarize, the presence of certain clauses in contracts is a result of the difference in preferences between school administrators and teachers and the occurence of certain events which affect both parties. We have argued that although both factors are important in measuring the impact of collective bargaining on educational decisions, the consequences of both can be reduced to the consequences of the event. This follows from the fact that events not only affect the preferences between administrators and teachers but also affects the preferences within the group of teachers.

Testable Hypotheses

The impact of contract items on the allocation of educational resources will depend upon two factors, the occurrence of a specific event which cause teachers and administrators to have different opinions about resource allocation decisions and the heterogeneity of teacher preferences.

The significance of declining enrollments over the past five years needs little comment. Administrators, who ten years earlier were complaining of a shortage of teachers are now faced with too many tenured teachers, too many schools, and too few students. Recognizing this problem, teacher associations have aggressively tried to bargain for job security provisions and to establish orderly procedures for laying off and recalling teachers. Administrators who are faced with these reductions

in staff constraints are forced to cut other educational resources. For example, we would expect that districts which are experiencing declining enrollments are also experiencing budget problems since many state aid formulas are based on student enrollment and the community may be less inclined to appropriate additional school funds. Faced with these constraints, administrators have a limited number of options. First, vacant teacher positions will not be filled, but if they are, part-time teachers and teacher aides will be hired instead of full-time teachers. Second, salary increases may be deferred to future years by promising greater retirement benefits if salary increases are curtailed. Third, the non-professional staff may be cut (except they may have their own union with separate reduction in force provisions). Fourth, working conditions may deteriorate with fewer preparation periods, larger class size, no inservice, fewer supplies and materials. Working conditions which are protected by contract provisions will probably not be effected unless some of the provisions are relaxed during a period of exigency.

The composition of the instructional staff will also change if the declining enrollments persist. With a reduction in hirings, the median age and experience of the group will increase and the distribution will become skewed to the right. This will be further enhanced by the lay off of young, untenured teachers. The change in the distribution of education among teachers is not as apparent. During this period, districts will not want to hire highly educated teachers since they command a much higher entry pay. Furthermore, in order to minimize personnel costs, districts will not encourage continuing education by providing study leaves or tuition, and they may bargain aggressively against significant salary steps for educational reimbursement. Teachers, on the other hand,

recognize that the only means of receiving pay increases is to move through the salary schedule by receiving additional education.

The consequences of a change in the composition of the teaching staff may be felt in the quality of education. Studies show that experience and education of teachers are positively correlated with student achievement. Reductions in one or the other teacher characteristics may reduce educational quality. On the other hand, unions may provide a stabilizing influence during hard times. By establishing orderly layoff and recall procedures, unions may give teachers a boost in morale in an otherwise dismal situation. If enthusiasm and commitment can be maintained, then the quality of education may not suffer as much as it would otherwise. Thus, we may find that certain contract items which represent grievance procedures, reduction in staff procedures, and working conditions may have a positive effect on the quality of education.

Footnotes - Chapter 2

1. Albert Hirschman, Exit, Voice, and Loyalty, (Cambridge, Massachusetts: Harvard University Press, 1970).

2. Richard B. Freeman and James L. Medoff, "The Two Faces of Unionism," The Public Interest, No. 57 (Fall, 1979), pp 69-93.

3. W. Kip Viscusi, Employment Hazards, An Analysis of Market Performance, (Cambridge, Massachusetts: Harvard University Press, 1979).

4. Perry reports that collective bargaining has served to enhance the salaries of long-service teachers who lack mobility alternatives in either a tight or loose labor market. Perry also finds that unions have altered the working conditions by shortening the school year, establishing preparation time, relieving teachers of non-teaching duties, providing pay premiums for teacher participation in after school activities, and accepting class size as a working condition issue and not a policy issue.

   Charles T. Perry, "Teacher Bargaining: The Experience in Nine Systems," Industrial and Labor Relations Review, Vol 33, No. 1 (October 1979) 3-17.

CHAPTER 3 - FORMAL MODEL AND METHODOLOGY

Introduction

The previous chapter discussed in fairly broad terms how decisions in public schools are made and to what extent collective bargaining contracts can constrain the decision making process. In order to measure empirically the impact of contracts on the allocation of educational resources and subsequently the impact of contracts on educational outcomes, a formal model must be constructed. This chapter attempts to present a formal model of decision making in public schools from which educational input demand equations and educational production functions can be derived and estimated.

The model constructed in this chapter and used implicitly throughout the study is based on the economic theory of constrained maximizing behavior. Administrators are assumed to have full knowledge of a set of educational objectives they wish to pursue and know how to quantify them. Also, they are assumed to know precisely what inputs are to be hired to maximize these objectives. Furthermore, it is assumed that administrators know how they might substitute one objective for another when faced with different price configurations and constraints.

When taken at face value, the assumptions are very stringent. It is difficult to believe that administrators have perfect information about how certain objectives can be attained. Certainly, the educational process is not as predictable as an assembly line production process in which inert inputs are combined to produce a finished product. Education is an interaction of two parties, teacher and student, each of whom act and react to the methods of instruction in school and out of school. Furthermore, even if the educational process was somewhat clear, the

objectives of the administrator are many and varied and it is difficult to quantify all aspects of the educational experience. Moreover, administrators must yield to pressures from the school board and parents in setting goals and policy, and therefore, the objective function is not entirely that of a single person, but a culmination of political maneuvering between different parties.

Despite the complexities of the process, the simple model of constrained maximization is still applicable. The reconciliation of fact with theory comes with the recognition of the purpose of a model. A model is designed to predict rather than describe. In this context, the merit of a theory does not rest on the obviously simplistic premise that school officials quantify goals and maximize them subject to constraints. Rather, the merit of a theory is in the end result, the ability to predict observed behavior. What is important is whether the process that we observe could result from the administrators, in pursuing their own interests, inadvertently behaving as if they were seeking to maximize the objective function subject to constraints. It is widely accepted in economics and other social sciences that in the long run, the behavior of the agent, even without perfect knowledge of outcomes and future events, will approach the allocation pattern that would be forthcoming from a well-informed maximizer.

Although the notion of long-run equilibrium is essential to the theory, it has not proven troublesome to the implementation of this type of model in economic demand theory. However, if certain factors are present which may prevent districts from reaching an equilibrium state such as may occur from declining enrollments, these factors can be incorporated into the model to describe the adjustment to equilibrium.

Therefore, with the reader informed about the purpose of the model and what to expect from it, we will proceed with a description of the formal model.

Formal Model

Many studies have applied the economic constrained maximization approach to the study of the allocation of resources in public schools. More notable works are by Chambers (1976), Barro and Carroll (1975) and Brown and Saks (1975). Although the Chambers article is most related to our work, since he examined the impact of unions although not contracts on resource allocation, we will follow the Brown and Saks formulation. The Brown and Saks model is better suited for our study because it provides a framework in which to look at the resource allocation process explicitly while simultaneously providing a teacher effectiveness model which measures the educational consequences of the allocation of decisions.

The Brown and Saks model allows us to separate the educational decision process into two stages. The first stage concentrates on the allocation of resources. The second stage relates the levels of these inputs to the scholastic achievement of students. Contract characteristics can be entered into the first stage in order to examine the significance of the constraints placed on the administration in allocating resources and in the second stage to show their influence on the effectiveness of these inputs.

The entire process can be described by the following four equations. We assume that the school administrator, representing the preferences of the school board, maximizes an objective function of individual student test scores subject to production, input, and budget constraints. That is,

(1) Max $W(S_1,\ldots,S_n, Z_1)$ subject to

(2) $S_j = f_j(X_{ij},\ldots,X_{mj}; Z_2)$ $\quad j = 1,N\ldots,N$

(3) $X_{kM} = g_k(X_{k1},\ldots,X_{kn})$ $\quad k = 1,M\ldots,M$

(4) $R = \sum_{i=1}^{M} p_k X_k$

The district welfare function W (·) is a function of student test scores (S) and community characteristics (Z_1). Student outcomes are the result of the interaction of M education inputs (X_{k1}) shared by the N students in the district who have different abilities and endowments (Z_2). The school administrator employes inputs, primarily teachers with different education and experience levels, subject to the factor prices in the budget.

Demand for Educational inputs

Demand equations for educational inputs are derived from the model by assuming that student test scores are a function of certain educational inputs (e.g., equation 2). By knowing which inputs produce the desired student outcomes, the administrator chooses the level of resources subject to the budget constraint. This can be seen by substituting equation 2 into equation 1 and then maximizing 1 subject to 4. The process yields input demand equations of the general form:

(5) $X_i = D_i(Z_1,Z_2,E,R,a)$.

The demand for school inputs depend upon the following factors:

1) community preferences for teacher attributes as related to educational outcomes and the attractiveness of the community to the teachers (Z_1);

2) the parameters of the educational production process as described by school officials (a); these parameters cannot be estimated by the demand equations alone, but will be estimated later by the educational production function.
3) the endowments, innate abilities, and non-school inputs of the students (z_2);
4) working conditions of the teachers (E);
5) the revenue for educational services (R).

Educational Production Function

The educational resource allocation model assumes that a direct relationship between inputs and outputs exist and that by responding to relative prices and budget constraints, administrators will employ the optimal combination of inputs to produce the desired level of outcomes. The educational production function estimates the way inputs are used within the district once the inputs are predetermined at the beginning of the school year. In terms of the optimization model, we consider the first three equations. However, in order to estimate the parameters of the production relationship, specific functional forms need to be postulated for the welfare function (equation 1), production constraints (equation 2), and input-allocation constraints (equation 3). Brown and Saks (1975) offer a particular appealing formulation for the school welfare function. It considers not only the central tendency of student test scores within the district but also their dispersion. They argue that many of the studies conducted previously found little significance between educational inputs and outputs due to the fact that the entire distribution of test scores must be considered and not merely the test

scores of the average student. Brown and Saks' model is especially suited for our purposes since it is formulated for district wide data and not individual student data.

Brown and Saks adopt a welfare function which is quadratic in both the mean and standard deviation of student test scores in the district. That is,

(6) $W(S_1,\ldots,S_N) = a\bar{S} + b\bar{S}^2 + c\sigma_S + d\sigma_s^2$

The production and input-allocation constraints are combined into an equation with linear combination of inputs:

(7) $\alpha\bar{S} + \beta\sigma_s^2 = w_o + \sum_{i=1}^{M} w_i I_i$

Maximization of the quadratic welfare function subject to the linear production constraints yields two reduced form equations in which the mean and standard deviations are separate functions of educational inputs:

(8) $\bar{S} = K_s + \frac{d\alpha}{b\beta^2+d\alpha^2} \sum_{i=1}^{M} \gamma_i I_i$

(9) $\sigma_s = K_\sigma + \frac{\beta b}{b\beta^2+d\alpha^2} \sum_{i=1}^{M} \gamma_i I_i$

When K_s and K_σ are constant terms.

The distributional impact of a change in inputs is expressed:

$$\frac{\partial \bar{S}}{\partial I_i} \div \frac{\partial \sigma}{\partial I_i} = \frac{d\alpha}{b\beta}$$

The ratio α/β represents the relative efficiency of the inputs on low and high achieving groups and (c/d) represents the district's preferences in allocating resources to the two groups.

We have separated the district decision-making process into two stages primarily for the purpose of estimating the allocation process. The decisions represented in each stage are actually made concurrently. Before deciding upon the combination of inputs, the administrators have a preconceived notion of the relative effectiveness of certain inputs on student outcomes. Resources are allocated at the beginning of the school year based upon budget constraints, relative prices, preconceived notion of production relationships, and the various weights placed upon the outcomes of different groups of students. Since the production relationship between inputs and outputs is not completely deterministic, the actual effectiveness of the initial decisions cannot be observed until the school year is completed. It may take a number of years to realize the full impact of the allocation decisions. Decisions made in subsequent years will be based in part on the experience of past years. We cannot capture this incremental process because of the inability to observe the behavior of districts over an extended period of time. We can infer behavior patterns of the districts by assuming that the observed behavior of districts is the culmination of a variety of forces that are continually working over time.

Impact of Collective Bargaining on District Decision Making

We have concluded in an earlier section that contractual items will impose constraints on the decisions of school administrators. We have also concluded that the impact of these constraints will be influenced by the presence of certain events. In our study the event of overwhelming and ubiquitous consequences is declining enrollments. Both the event and the constraint items can be entered into the resource allocation model by

adding additional constraints to the existing four equation system. The collective bargaining constraints take the form:

(10) $(1-\alpha)\overline{X}_i \geq X_i$

if the contract item places an upper bound on the amount of input X that can be used, and

(11) $(1-\alpha)\overline{X}_i \leq X_i$

if the contract places a lower bound on the use of resources, where $\overline{X}$ is the constraint cited in its contract.

An example of the first case would be the presence of an item which designates the maximum number of teacher aides hired by the school. The second case is illustrated by a contract item which places a limit on the teacher-student ratio. When considering the demand for teachers, this provision places a lower limit on the number of classroom teachers which can be hired given school enrollment.

The parameter α denotes whether or not the district is facing declining enrollments. It takes on a value of 0 if the district is facing declining enrollments; 0 otherwise. The presence of this event may effect the stringency of the constraint. For example, consider two districts each of which have a reduction in force provision in their contracts. One district is facing declining enrollments while the other is experiencing an increase in students. Obviously, the reduction in force provision will have little impact on the number of teachers in the school district but a significant effect on the first district.

The constraints as written in (10) and (11) are resource specific constraints. That is, a specific resource is mentioned explicitly in the contract and a limitation is placed on it. The limitation may be of two

kinds. It may explicitly state a specific value such as the minimum allowable teacher student ratio or the language of the contract may require that teachers be laid off in order of seniority.

Besides the direct affect of a contract item, indirect effects may occur. The indirect effects occur primarily through the substitution away from constrained inputs. For example, districts which have a limitation on class size but which have financial difficulties due to declining enrollments may hire more part-time teachers than they would otherwise. The extent to which part-time teachers will be hired depends upon the ability to substitute part-time for full-time and the existence of constraints upon the hiring of part-time teachers.

The direct and indirect effects of contractual constraints can be stated more explicitly by considering the various components of the change in a particular input. Consider a two input case, full-time and part-time teachers. The change in the number of full-time teachers (X_1) is written:

$$(12)\quad dX_1 = \left(\frac{\partial X_1}{\partial Q_1} + \frac{\partial X_1}{\partial X_2}\frac{\partial X_2}{\partial Q_1}\right)dQ_1 + \left(\frac{\partial X_1}{\partial Q_2} + \frac{\partial X_1}{\partial X_2}\frac{\partial X_2}{\partial Q_2}\right)dQ_2$$

and the change in the number of part-time teachers,

$$(13)\quad dX_2 = \left(\frac{\partial X_2}{\partial Q_1} + \frac{\partial X_2}{\partial X_1}\frac{\partial X_1}{\partial Q_1}\right)dQ_1 + \left(\frac{\partial X_2}{\partial Q_2} + \frac{\partial X_2}{\partial X_1}\frac{\partial X_1}{\partial Q_2}\right)dQ_2$$

The equations can be simplified by assuming and realistically so, that each contract item addresses a specific resource. In this example, Q_1 affects X_1 and Q_2 affects X_2, but Q_2 does not affect X_1 directly nor vice versa. Thus, the partial derivatives $\frac{\partial X_1}{\partial Q_2}$ and $\frac{\partial X_2}{\partial Q_1}$ are zero. Therefore,

(12) and (13) can be rewritten respectively as,

$$(14) \quad dX_1 = \left(\frac{\partial X_1}{\partial Q_1}\right) dQ_1 + \left(\frac{\partial X_1}{\partial X_2}\frac{\partial X_2}{\partial Q_2}\right) dQ_2$$

$$(15) \quad dX_2 = \left(\frac{\partial X_2}{\partial X_1}\frac{\partial X_1}{\partial Q_1}\right) dQ_1 + \left(\frac{\partial X_2}{\partial Q_2}\right) dQ_2$$

Notice that in this formulation, the impact of Q_2 on X_1 can come about only if X_2 is substituted for X_1 and Q_2 constrains the employment of X_2. If no substitutes are possible for X_1, then no other contract item which does not address X_1 explicitly can affect the allocation of X_1. Therefore, when we examine the impact of a contract item across a number of resources, the significance of the impact of the item not directly associated with the input is due primarily because of the substitution across inputs.

By including additional resource constraints associated with collective bargaining contract items, the demand equations for educational resources include the contract items specific to each input included in the decision making and the occurrence of the event. Thus, the demand for input i is written:

$$(16) \quad S_i = D_i(Z_1, Z_2, E, R, a, Q_1, \ldots, Q_M,) \quad i=1,\ldots,M.$$

Since we are concerned primarily with the decision to distribute general expense funds to the various school resources, we need to concentrate on the impact of contract items on the propensity to allocate funds. The unconstrained demand equation is written in linear form:

$$(17) \quad \ln X_i = \alpha_{oi} + \alpha_{1i} \ln B + \alpha_{2i} Z + \varepsilon$$

where B is the total operating fund per student and α_{1i} is the budget elasticity of the allocation of funds to resource X_i. For example, suppose that X_i represents instructional expenditures per pupil, and that α_{1i} is 0.85. We would interpret this to mean that for every one percent

increase in the total budget, per pupil instructional expenses increase by 0.85 percent. Since contract items under certain conditions may constrain budgetary decisions, we may observe that the presence of a contract item may alter this elasticity. It may be the case that a district facing declining enrollments but constrained by a reduction in seniority provision will retain more senior, higher paid teachers at the expense of lower paid junior staff. The result is that a district with the item will need to appropriate a greater proportion of the total budget to instructional than a district which is not constrained by the seniority provision.

We can, therefore, write α_1 as a function of the contract item and the event:

(18) $$\alpha_1 = \beta_o + \beta_1 Q + \beta_2 D + \beta_3 Q*D$$

where the i has been dropped for notational simplicity.

Variable Q and the event variable D are dichotomous variables.

Q	D	I	Q	D	Q*D
0	0	1	0	0	0
1	0	1	1	0	0
0	1	1	0	1	0
1	1	1	1	1	1
		β_0	β_1	β_2	β_3

If we associate the coefficients β_0, β_1, β_2, β_3, with the four right most columns in the table, we can express the expectation of the value of α, the budget elasticity, conditional upon the various combinations of Q and D as

$$E(\alpha \mid 0\ 0) = \beta_o$$

$$E(\alpha \mid 1\ 0) = \beta_o + \beta_1$$

$E(\alpha|0\ 1) = \beta_0 + \beta_2$

$E(\alpha|1\ 1) = \beta_0 + \beta_1 + \beta_2 + \beta_3$

Four different situations can be tested by using a combination of the coefficients listed above.

The differential effect of contract items in districts facing declining enrollments can be tested by considering the difference between $E(\alpha|\ 1\ 0)$ and $E(\alpha|\ 0\ 0)$ which is equal to β_1.

The differential effect of contract items in districts facing increasing enrollments can be tested by considering the difference between $E(\alpha|1\ 1)$ and $E(\alpha|\ 0\ 1)$ which is $\beta_1 + \beta_3$.

The differential effect of the change in enrollments for districts with the contract item can be tested by considering the difference between $E(\alpha|1\ 1)$ and $E(\alpha|\ 1\ 0)$ which is $\beta_2 + \beta_3$.

The differential effect of the change in enrollments for districts without the contract item can be tested by considering the difference between $E(\alpha|0\ 1)$ and $E(\alpha|\ 0\ 0)$ which is β_2.

In order to evaluate the net impact of the contract item and/or event, we have to compare the value of the appropriate coefficient(s) with the estimate of budget elasticity in the absence of these effects ($E(\alpha|\ 0\ 0) = \beta_0$). Suppose that β_0 is .85 and β_1 is .05. We can conclude that for districts facing declining enrollments, the presence of the contract item increases the budget elasticity by .05. In terms of dollar increases, the elasticity of 0.85 means that an increase of $100 per pupil of total operating budget results in an increase of $46.70 of instructional funds when both the total budget and instructional funds are evaluated at their respective means of $2,170.62 and $1,193.72. The contribution of the contract item of 0.05 to the budget elasticity results in an

additional increase of $2.50 per pupil for that same increase in total operating expenses of $100 per pupil.

The other combination of coefficients can be interpreted in a similar fashion.

In order to consider the impact of contract items on the budgetary process of school districts, we divide the total per pupil operating budget into various financial categories. The first three categories are instructional expenses per pupil, employee fringe benefits, and administration expenses. Expenditures on items such as operation and maintenance, Chapter 241 programs, pupil services, and transportation are grouped into the category labeled "other".

The instructional category is further broken down into total teacher salaries per pupil and another "other" category which consists primarily of textbooks and materials. Salaries per pupil are divided into its components of teachers per pupil and average teacher salary. Finally, teacher attributes such as average years of experience in the district and the percentage of teachers with masters degrees are considered. The schematic diagram in Figure 3-3 helps to clarify the categories.

Figure 3-3

Financial Categories Considered in the Analysis

1) $\frac{\text{total operating budget}}{\text{pupils}} = \frac{\text{instructional expenditures}}{\text{pupils}} + \frac{\text{administration}}{\text{pupils}} + \frac{\text{employee benefits}}{\text{pupils}} + \frac{\text{"other"}}{\text{pupils}}$

2) $\frac{\text{instructional}}{\text{pupils}} = \frac{\text{total teacher salaries}}{\text{pupils}} + \frac{\text{materials}}{\text{pupils}}$

3) $\frac{\text{total teacher salaries}}{} = \left(\frac{\text{teachers}}{\text{pupils}}\right) \times (\text{average salary})$

4) $\frac{\text{teachers}}{\text{pupils}} = \begin{cases} \text{average years experience} \\ \text{percentage of teachers with masters degrees} \end{cases}$

Impact of Collective Bargaining on Teacher Effectiveness

The inclusion of contract items into the teacher effectiveness equations is similar to the method used for the input demand equations except for different reasons. In the previous section, we have shown that the distribution of student test scores in a district is a function of the teacher attributes, student attributes, parent attributes, class size, and the size of the district.

Teacher collective bargaining can affect the distribution of student test scores in two ways. First, contract items can contain the allocation of educational resources. For example, certain contract items may influence the number of teachers employed which in turn affects class size and the attributes of the teachers. Second, since teachers and students are not inert inputs into the educational process, contract items may affect the productivity of teachers and students.

Murnane (1980), in a recent critique of the educational production function literature, suggests that the behavior of students and teachers are very sensitive to the methods used to allocate resources. Murnane illustrates the response of teachers to policy changes by describing a situation in which teachers face layoffs due to declining enrollments. Many districts base layoffs on seniority, but some districts rely on administrators evaluation of teachers in order not to dismiss the most effective teachers. The anticipated result of the latter approach is to preserve a high quality of instruction by maintaining the best teachers. However, Murnane suggests that this policy may be less successful than originally hoped for three reasons. First, effective teachers may resign to escape the competitiveness introduced by the reduction criterion. Second, cooperation among teachers may decline in response to the competitive atmosphere. Third, over time, as teachers alter their behavior, principals may find that their evaluations of teachers no longer reflect performance as well as they once did. Consequently, contract items may affect the productivity of teachers.

Certain district policies as specified in contract items may also affect the performance of students. For example, districts which have experienced a long and bitterly contested period of contract negotiations and even a strike may provide a less settled environment in which students can learn. We would expect in this situation to find lower student test scores.

The impact of contract items can be entered into the teacher effectiveness in two ways, 1) as an intercept term, and 2) as an interaction term with the teacher attribute variables, average years experience and percentage of teachers with masters degrees. The contract item is entered

as an intercept term to reflect the notion that certain educational policies as represented by contract items may affect the learning environment of the student independent of the productivity of the teacher. The contract item is not entered as an interaction term with student attributes since the production function is not explaining student productivity but teacher productivity. Contract items are entered as interaction terms with teacher attributes in order to measure the impact of contract items on teacher productivity as measured by the coefficient of the teacher attribute variable.

Since districts facing declining enrollments may be more constrained by the contract provision than increasing enrollment districts, both the event and contract items are entered as interactive terms with teacher attributes similar to the method used for the input demand equations. The various scenarios described earlier are equally applicable in this case.

With the inclusion of contract items and the event, the teacher effectiveness equation takes the following form:

$$(19)\quad \bar{S} = K_s + (\alpha_o Q + \alpha_1 D + \alpha_2 Q^*D) + \left(\frac{d\alpha}{b\beta^2 + d\alpha^2}\right)\left(\sum_{i=1}^{2} (\beta_o + \beta_1 Q + \beta_2 D + \beta_3 Q^*D) I_i + \sum_{j=3}^{M} \gamma_j I_j + \varepsilon\right.$$

$$(20)\quad \sigma_s = K_\sigma + (\alpha_o' Q + \alpha_1' D + \alpha_2' Q^*D) + \left(\frac{d\alpha}{b\beta^2 + d\alpha^2}\right)\left(\sum_{i=1}^{2} (\beta_o' + \beta_1' Q + \beta_2' D + \beta_3' Q^*D) I_i + \sum_{j=3}^{M} \gamma_j' I_j + \varepsilon'\right.$$

The symbols are the same as defined earlier.

Conclusion

This chapter describes the basic model underlying our study of collective bargaining in New York and Michigan. We use the economic constrained maximization approach to describe the behavior of educational decision makers. First, an educational production function is specified and then modified by the addition of collective bargaining constraints. Second, the contract items are included in a teacher effectiveness model to show how the items may affect student test scores.

Throughout this discourse we have entered each contract item separately into the demand equations. We have done this to simplify both the analysis and the interpretation of the results. In an appendix we examine the extent to which this procedure can bias the estimates and find that very little bias is introduced. Therefore, we proceed with the analysis confident that the estimation equations are specified properly.

CHAPTER 4: COLLECTIVE BARGAINING IN NEW YORK

Introduction

On April 21, 1967 Governor Rockefeller signed into law the New York State Public Employees Fair Employment Act, more commonly known as the Taylor Law, after George Taylor, Chairman of the Governor's committee on Public Employee Relations. This law was designed to make up for the defects of its predecessor, the Condon-Wadlin Act of 1947, which not only carried harsh, but largely ineffective, penalties against strikers but also provided no public employee bargaining rights.

The avowed purpose of the Taylor Law was to "promote harmonious and cooperative relationships between government and its employees and to protect the public by assuring, at all times, the orderly and uninterrupted operations and functions of government." The law gave bargaining rights to representative units of all public employees and created impasse procedures intended to avoid the need for strikes. It also prohibited public employee strikes and invoked severe penalties of violators of the no-strike provision.[1]

The impasse procedures under the Taylor law included mediation, fact finding, "superconciliation" (a higher level mediation process, usually administered by a staff member of the Public Employees Relations Board) and, until 1974, a "legislative hearing." This last step was really a hearing before the board of education, which had the absolute final authority to resolve the dispute. Teacher organizations opposed this step as being biased in favor of management, and they succeeded in 1974 in having amendments passed which eliminated this step. However, the board still has the final authority to resolve the dispute.[2]

A distinctive feature of the New York collective bargaining law is

the broad scope of bargaining required or permitted under the law and subsequent legislative and administrative rulings related to the law.

In 1969 an amendment providing "improper-practice" (unfair labor practice) jurisdiction for PERB was passed. The joint legislative committee which reported on this amendment stated that under these amendments:

> PERB has been given the power to require the parties to negotiate in good faith. The most significant aspect of this authority is in the determination of the proper scope of bargaining.[3]

PERB's chief legal officer, Jerome Lefkowitz, has stated the following conditions for matters that are to be considered "mandatory subjects of bargaining."

1. The matter must be a term and condition of employment.
2. It must be within the discretion of the employer.
3. It may not go to the mission of the employer.[4]

If a subject is deemed non-mandatory, PERB has ruled that bargaining on that subject may be either prohibited (non-permissible) or permitted (permissive). An example of the former is the agency shop, which the Taylor law itself explicitly prohibits. An example of the latter is class size, which PERB has held to be a non-mandatory subject of bargaining, but which can still be negotiated on. If a subject is deemed permissive, a party may press for negotiations on that subject only through the mediation stage. If the other party has not agreed to negotiate by that time, it must be dropped before submitting the dispute to a factfinder.[5]

The basic criteria for establishing the mandatory/non-mandatory nature of a bargaining issue was established in a 1972 court of appeals

case, Board of Education, Town of Huntington vs. Associated Teachers of Huntington.

> Public employers must, therefore, be presumed to possess the broad powers needed to negotiate with employees as to all terms and conditions of employment. The presumption may, of course, be rebutted by showing statutory provisions which expressly prohibit collective bargaining as to a particular term or condition {of employment} but, "{i}n the absence of an express legislative restriction against bargaining for that term of employment contract between a public employer and its employees, the authority to provide for such {term} resides in the {school board} under the broad powers and duties delegated by statutes." {Citation omitted.} It is hardly necessary to say that, if the Board asserts a lack of power to agree to any particular term or condition of employment, it has the burden to demonstrate the existence of a specific statutory provision which circumscribes the exercise of such power. It has failed to meet this burden in the present case.[6]

This established an extremely broad scope of bargaining for all public employees, and for New York State teachers in particular. This may explain why in a 1977 study examining the scope of bargaining in 14 selected states, New York State held a solid number one position as the state with the greatest number of demands that were considered either mandatory or permissive subjects of bargaining (New York, 54; New Jersey, 43; Michigan and Oregon, 34). New York State teachers have alone, among the fourteen states, gained the following terms as either mandatory (M) or permissive (P):

1. Tenure (M)
2. Death Benefits (M)
3. Reimbursement for job related personal property damage (M)
4. Establishment of joint committees (M)
5. Non-job related benefits (P)
6. Filling job vacancies (P)

7. Policies concerning non-unit employees (P)
8. Teachers inservice training (P)

Among other significant items that are rarely mandatory in most states but are in New York are the following:

1. Impact of change in class size
2. Work rules, reimbursement of tuition or continuing education
3. Rules and regulations governing teachers powers and duties
4. Paid or unpaid time off for union activities.[7]

In conclusion, the Taylor Law is itself relatively broad and vague in defining scope of bargaining (i.e., it does not provide a specific listing of mandatory or prohibited subjects of bargaining, nor does it include a management-rights clause). However, subsequent PERB and court decisions have clarified the scope-of-bargaining question significantly. Because of New York's relatively long experience with public sector collective bargaining and the relatively large number of items about which teachers have the right to negotiate, New York is an excellent state in which to examine the impact of collective bargaining on resource allocation decisions and ultimately the effectiveness of public schools.

In order to conduct this examination, we have collected two kinds of data. The first are data on New York State school districts. The second are data on collective bargaining contracts.

School district data were obtained from the New York State Department of Education and include district level financial data, student achievement scores, student characteristics information, teacher salary and benefits information, teacher characteristics data, and school program data. The data are complete for all school districts for the 1976-77 and 1977-78 school years. The school district information appears to be

highly accurate. The state requires each local school district to report the information in a very detailed accounting fashion. The financial data are used to distribute state school support funds and for state auditing purposes. Teacher salaries come from payroll records which consequently eliminates many of the errors frequently encountered in surveys.

The second kind of data employed in the analysis of collective bargaining in New York school districts are data on the specific provisions in collective bargaining agreements covering the 1977-78 school years. Two sources of information about individual district contracts are available for public schools in New York state. The first source is an analysis done by the New York State United Teachers (NYSUT), an affiliate of the American Federation of Teachers (AFL-CIO).[8] The NYSUT has analyzed 455 contracts from the 549 public school districts with grades K through 12. The second source is from the National Education Association which analyzed contracts from all 736 New York public school districts. Both sources obtained their information by examining contracts from each district and categorizing the contents into a number of items. The NYSUT data contain yes-no responses to a list of 86 items. If a contract contains a provision, such as reduction in force or class size limitation, then a yes response is recorded. The absence of such a provision in the contract is recorded with a no.

The NEA analysis was conducted in a similar manner. Both analyses contain information on contracts of bargaining units which are not affiliated with the respective organizations. The NEA data contain contracts of AFT affiliated bargaining units, NEA affiliated units, independent units, and contracts of districts which do not have formal bargaining representatives. The NEA data show that of the 736 public school districts,

84 are affiliated with NEA, 54 are non-affiliated or have no formal bargaining unit, and the remainder are affiliated with AFT. The NYSUT data also contain contracts of districts not affiliated with AFT with roughly the same percentage of districts included of each type.

Both sources of contract information are suitable for the purposes of this study. However, we feel that only one source should be used since certain biases might appear due to different recording techniques and classification errors. We have selected the NYSUT data over the NEA data for a number of reasons. First, the NYSUT data provide a more detailed analysis of contracts than the NEA data. Second, the NYSUT analysis is more easily transferrable to machine readable form. Third, we feel that since an overwhelming number of districts are affiliated with AFT, the in-house contract analysis is more accurate. Finally, a random check of the NYSUT data with the NEA data reveals very little discrepancy between items which were contained in both analyses.

The New York City School District is excluded from our analyses of the impact of collective bargaining in New York State. The district is so large relative to other districts and has so many special financial arrangements, that its behavior is different from other districts. Its inclusion would distort our findings.

The analysis of collective bargaining in New York proceeds in the following manner. We first examine variations in financial and teacher characteristics among districts affiliated with the NEA, AFT, or an independent bargaining unit. To establish a baseline for analyzing union impacts on public schools, we next look at the non-union determinants of school district expenditures. Third, we explore the effects of unionization itself on resource allocation. This is followed by an

analysis of how the number of contract items affects resource allocation. Fifth, we see if the number of contract item affects the level of spending for public education in a community. We continue the process of disaggregating contracts by looking at the effects of individual groups of contract items on resource allocation patterns in New York school districts. Sixth, we ask whether collective bargaining is more or less effective in districts with declining enrollments. The question of how collective bargaining affects the quit rate for teachers is considered next. Finally, we explore the relationship between collective bargaining and teacher effectiveness.

Union Affiliation and District Characteristics

When measuring the impact of various specific contract items on the allocation of educational resources, we shall use all the contracts analyzed by NYSUT, and not merely districts represented by AFT affiliated bargaining units. Although the AFT affiliated districts dominate teacher collective bargaining in New York, it is instructive to examine the differences in characteristics of the three types of districts.

Table 4-1 lists the means of various financial categories and teacher attributes for AFT affiliated dsitricst, NEA affiliated districts, and independent and non-affiliated districts.

Table 4-1

Mean Values of New York District Characteristics
By Union Affiliation 1976-77

District Characteristics	AFT	NEA	Independent Non-Affiliated
Enrollment	3,603	2,508	2,918
Experience/Pupil	2,207.48	2,025.44	2,072.66
Teachers	180	128	141
Teachers/Student	.051	.052	.050
Ave. Salary	15,337	13,869	14,993
Ave. Experience	12.09	12.02	11.89
% Masters	70	54	69
Inst. Exp./Pupil	1,210.55	1,121.96	1,129.83
Adm Exp./Pupil	68.98	47.36	59.07
Benefits/Pupil	331.89	301.81	313.51
Salaries/Pupil	740.87	674.40	689.41
% Urban	47	31	39
% Incr. Enrollment	21	13	19
% Traditional	94	97	97
% Cluster	09	09	09
% Open	13	08	12
Benefits/Teacher	7,265	6,769	7,057
% Instr. Expense	55	55	55
% Adm. Expense	03	02	03
% Salary/Inst. Expense	61	60	61
% Benefits	15	15	15

The figures reveal that AFT affiliated districts have the largest student enrollment and NEA affiliated districts have the smallest. Part of the difference in enrollments may be explained by the location of the districts represented by the respective bargaining units. AFT districts are much more urbanized than NEA districts. Moreover, a larger percentage of AFT districts have experienced increasing enrollments since 1972 than NEA districts. We also find a substantial variation between district types of total operating budgets per pupil with AFT districts outspending NEA and nonbargaining districts by as much as $182 per pupil. The distribution of the budget does not differ significantly between the various financial categories. All districts spend the same proportion of the budget for instructional purposes and employee benefits. A slight variation does exist for administration and salary expenditures with NEA districts allocating a slightly lower percentage of the budget to these two categories than the other two district types.

Teacher attributes remain fairly constant across districts with AFT districts claiming a slight edge in average years of experience and percentage with masters degrees. AFT districts also have a substantial advantage in average teacher salaries with the NEA districts, somewhat surprisingly, falling behind the independent and nonaffiliated districts.

Table 4-2 shows a comparison of the percentage of districts with selected contract items by district type. The most striking aspect of the table is that the frequencies do not vary much regardless of the affiliation in the bargaining status of the district. Contracts are negotiated for an average of a little over two years for all categories. Very few districts automatically base salary increases on CPI statistics. Binding arbitration is almost universally used in

negotiation deadlocks. There are, however, some surprising trends between bargaining districts and non-affiliated districts. A smaller proportion of non-affiliated units have class size provisions in their contracts while a larger percentage have provisions for educational policy committees. Another striking difference occurs in the labor jurisprudence categories. Although the same percentage of districts have staff reduction procedures, seniority clauses and recall to position provisions occur in a higher percentage of nonaffiliated and independent districts than those affiliated with the national organizations.

Table 4-2

Percentages of New York School Districts With Selected Contract Items By Union Affiliation 1976-77

		Union Affiliation		
	Contract Items	AFI	NEA	Independent Non-Affiliated
1	Length of Contract	2.25	2.10	2.13
3	C.P.I. Used for Sal.	9	13	10
9	Binding Arbitration	85	90	85
11	BD of ED Contract	14	7	15
20	Inservice Provision	44	25	38
31	Agency Fees	5	2	3
40	Class Size Provision	57	55	48
44	Ed Committee Ed Policy	39	38	45
46	Performance Contract	12	13	15
47	Hire Certified Personnel	18	18	20
54	Staff Reduction Procedure	39	40	40
56	No Reduction	4	0	8
57	Seniority Clause	20	15	23
58	Recall to Position	12	12	18
61	Dismissal for Cause	39	40	43
62	Severance Pay	3	0	3
65	Personal Days	95	98	98
82	Health Insurance	97	97	90
84	Life Insurance	27	12	13

Nonunion Determinants of School District Expenditures

The administration's perception of quality education and consequently the allocation of educational resources are sensitive to a number of factors. The first factor is the composition and size of the student body. Districts with a relatively large percentage of students from low income families or students which have little motivation as evidenced in a high dropout rate, may require different educational inputs than districts with more affluent and motivated students. Another factor is the attributes and preferences of the community. Districts with a larger than average proportion of parents who have attended college and thus place a relatively high value on education will place greater emphasis on instructional expenditures. Thus, these various community and student characteristics determine the demand for educational inputs.

Since education is primarily the interaction between teacher and student, the classroom teacher is the primary educational input. However, the total school budget is divided between a number of categories. In New York eight components of educational resources will be considered: 1) instructional expenditures per pupil; 2) administration expenditures per pupil; 3) employee benefits per pupil; 4) total teachers' salaries per pupil; 5) teacher student ratio; 6) average salary of teachers; 7) the percentage of teachers with masters degrees; and 8) the average years experience of teachers.

Table 4-3 shows how the budget is allocated to the various items. Total operating expenditures per pupil are divided between the first three categories and a residual category we will call "other." Instructional expenditures per pupil are allocated primarily to teacher salaries, and an incremental increase in salaries can go either to raise the

Table 4-3

Educational Demand Equations for New York School Districts, 1976-77

Independent Variables	Dependent Variables									
	Inst/Pupil	Adm/Pupil	Benefits	T/S	Ave Sal	% Masters	Ave Exp.	Sal/P	Other	Means
I	10.79 (578.07)	7.33 (35.58)	9.45 (377.77)	-3.22 (133.3)	9.07 (231.9)	-.87 (20.23)	-1.55 (13.21)	10.32 (398.36)	10.23 (173.07)	
OpExp Pupil	.000004 (50.55)	.000005 (5.34)	.000004 (38.85)	.000001 (12.31)	.000002 (14.22)	.000002 (10.12)	8.32 E-7 (1.71)	.000004 (34.34)	.0000035 (14.00)	2,182.66
Enroll	.00001 (6.06)	.00015 (7.69)	.000013 (5.73)	-.00002 (6.61)	.00003 (7.33)	.00003 (7.95)	-.0003 (27.98)	.000016 (6.34)	-.000034 (6.22)	3,467.
$(Enroll)^2$	-2.5 E-10 (3.78)	-3.41 E-9 (4.84)	-2.70 E-10 (3.16)	3.4 E-10 (4.10)	-5.3 E-10 (3.99)	-7.4 E-10 (5.10)	5.79 E-9 (14.02)	-4.50 E-10 (4.86)	7.57 E-10 (3.75)	26,173,703
Dropout	-.002 (.56)	-.10 (3.25)	.0036 (.95)	.014 (3.44)	-.008 (1.28)	-.008 (1.19)	.062 (3.38)	-.0010 (.23)	.011 (1.27)	1.30*
% Welfare	-.003 (.86)	.055 (1.52)	.0013 (.28)	.002 (.57)	-.02 (3.41)	-.005 (1.98)	.019 (.93)	-.019 (4.01)	.0018 (.17)	2.69
% Parents w/College	.11 (3.52)	.13 (.37)	.074 (1.74)	-.006 (.15)	.09 (1.38)	.14 (2.00)	-.34 (1.71)	.19 (4.10)	-.27 2.65	.28
	.90 841.03 2.79	.34 38.02 235.89	.86 461.96 3.47	.37 42.48 3.19	.59 104.18 8.34	.49 71.83 10.01	.74 264.75 110.76	.85 428.29 4.064	.37 43.82 19.42	
Means (non-logs)	1194	65.14	325.32	.051	14833	0.68	12.26	728.82	505.13	

Note: Dependent variables in logs, t-ratios in parentheses.

*Dropout = Number of students dropping out in grades 9-12 divided by the total K-12 population of the school districts.

average salary of teachers or to increase the teacher student ratio. The average salary of teachers, in turn, depends upon the characteristics of teachers, educational attainment and experience, since the increments in the salary schedule are based on these two teacher attributes.

Table 4-3 shows the means of the various educational input categories, the total operating budget per pupil, and the various community and student characteristics for public school districts in the state of New York for the 1976-77 school year. We find that on average, $2,182 is spent per pupil across the state. Of this, $1,194 per pupil goes to instructional expenses, $65 goes to administrative services, $325 to employee benefits and the rest is spent on items such as special education, transportation and building maintenance. Within the instructional expenditures per pupil category, $728 of the $1,194 is allocated to teacher salaries. The average teacher salary is $14,833 and the average class size is 19.50 or .051 teachers per pupil. Teachers have on average 12 years of experience and roughly 68 percent of the teachers have masters degrees. The average school enrollment is 3,467 students with 2.69 percent from families on welfare and 1.3 percent of all students have left school before finishing high school. On average 28 percent of the parents in New York school districts have attended college.

The estimates of the educational input demand equations are also displayed in Table 4-3. We find that a higher than average total operating budget per pupil increases all categories of inputs and the estimate is highly statistically significant. Districts with higher than average enrollments also increase all categories of inputs except for the teacher/student ratio which declines significantly indicating larger class sizes in larger districts. The negative coefficient on the squared

term for enrollment indicates that the positive effect of enrollment on inputs diminishes as enrollment increases. The dropout rates yield mixed signs. The statistically significant coefficients indicate that districts with higher than average dropout rates have smaller class sizes and allocate less funds to administration. Furthermore, districts with a higher than average percentage of students on welfare have lower than average teacher salaries, a lower percentage of teachers with masters degrees but no significant effect on the teacher student ratio. On the other hand communities with higher than average percentage of parents who have attended college have a greater percentage of teachers with masters degrees, allocate more funds for instructional purposes, provide more employee benefits and spend more on teacher salaries.

The coefficients can be transformed into elasticities as shown in Table 4-4. We find that a 1 percent increase in total operating expenses/pupil brings about a .87 percent increase in instructional expenses per pupil. Expenditures for administration are more elastic than instructional expenses, benefits about the same, teacher student ratio much less elastic and average salary about half that of instructional expenses.

Since we are concerned primarily with how the total budget is allocated to the various resources, it is interesting to examine how a dollar increase in total budget per pupil is distributed by the district at the mean. Table 4-5 shows that of the $1 increase, $.48 is allocated for instructional purposes, $.03 for administration purposes, $.13 for employee benefits, and the remainder $.36 for "other" purposes. Of the $.48 that goes for instructional expenses, roughly 60 percent or $.29 is spent on salaries and $.19 on textbooks and materials. Furthermore, it appears that very little of the $.29 that is allocated to salaries is used to

Table 4-4

Elasticities of Demand Equations, Computed at the Means, for New York State School Districts, 1976-77

Independent Variables	Inst/Pupil	Adm/Pupil	Benefits/P	T/S	Av Sal	% Masters	Av Exp	Sal/P	Other
Op Exp/Pupil	.87	1.09	.87	.22	.44	.44	.15	.87	.76
Enroll	.035	.52	.045	-.07	.104	.104	-1.04	.056	.12
Dropout	-.003	-.13	.005	.02	-.01	-.01	.08	-.001	.014
% Welfare	-.008	.148	.003	.005	-.05	-.04	.09	-.05	.005
% Par Col	.03	.037	.021	.02	.03	.04	-.07	.05	-.08

Table 4-5

Effect of a One Dollar Increase on Budget Categories for the Average School District in New York, 1976-77

	Total Budget				Instructional		Salaries	
	Inst/Pupil	Adm/Pupil	Benefits/P	Other	Sal	Other	Av Sal	T/S
Dollars Allocated	$.48	$.03	$.13	$.18	$.29	$.19	$.29	$0
		.64		.36				
		1.0				.48		

increase the teacher student ratio and most goes to increase the average salaries of teachers.

Unionization and Resource Allocation in New York School Districts

When examining the mean characteristics of school districts in New York, we find a substantial difference in the level of spending between districts which bargain and those which are not formally represented and between NEA affiliated and non-NEA affiliated districts.

It is interesting to test whether the allocation behavior between these district types are statistically significant. In order to test for the differences, variables reflecting the affiliation of the district and the bargaining status are entered into the demand equations described in the preceding section. The variables are entered as interactive terms with the budget variable so that the difference in the internal allocation of funds can be recorded.

The results of the estimation are contained in Tables 4-6 and 4-7. For the sake of exposition, we include the estimates of only the union related variables even though all variables included in Table 4-3 have been entered into the regression. Table 4-6 shows the difference in behavior between NEA affiliated and non-NEA affiliated districts. The most significant difference in that NEA affiliated districts have significantly higher teacher student ratios than non-NEA affiliated districts.

The ability of NEA districts to maintain larger staffs in relation with enrollments is possible partly due to the slightly lower percentage of teachers with masters degrees. Also, NEA affiliated districts appear to put less emphasis on administrative activities.

The difference in behavior between districts which are represented by a formal bargaining unit (be it NEA affiliated, AFT affiliated, or independent) and those which are not represented is less pronounced. The major

Table 4-6

Difference in Allocation Behavior of NEA Affiliated and Non-NEA Affiliated Districts in New York, 1976-77. Estimates Reported as Elasticities

	Inst/Pupil	Adm/Pupil	Benefits/Pupil	Salaries/Pup	Other	Ave Sal	T/S	% Masters	Ave Exp
Budget	.85	.98	.83	.81	.79	.46	.26	.35	.18
	(52.89)	(6.04)	(38.97)	(36.26)	(17.11)	(14.27)	(13.56)	(10.30)	(1.75)
NEA Affiliated Districts (NEA*Budgets)	.0032	-.019	-.017	-.007	.037	-.027	.036	-.057	.097
	(.31)	(1.87)	(1.27)	(.52)	(1.28)	(1.31)	(2.94)	(2.67)	(1.46)

*t-statistics in parentheses.
Only budget and union variable shown.

Table 4-7

Difference in Allocation Behavior of Nonbargaining and Bargaining Districts in New York, 1976-77. Estimates in Elasticities

	Inst/Pupil	Adm/Pupil	Benefits/Pupil	Salaries/Pup	Other	Ave Sal	T/S	% Masters	Ave Exp
Budget	.85	.98	.83	.81	.79	.46	.26	.35	.18
	53.07	(6.12)	(39.04)	(36.38)	(17.05)	(14.31)	(13.46)	(10.32)	(1.74)
No Formal Bargaining (NonBar*Budg)	.005	-.014	.000	-.011	.013	.050	-.022	.027	-.073
	(.40)	(.11)	(.05)	(.63)	(.37)	(2.01)	(1.49)	(1.04)	(.90)

*t-statistics in parentheses.
Only budget and union variable shown.

difference is with the average salary. The results show that salaries in non-bargaining districts are more sensitive to budget increases than in bargaining districts. This result is curious since most studies have found that formal bargaining increases teacher salaries. A study by Lipsey and Drotning (1973) finds that in 1970 bargaining units in New York increase salaries by as much as 15 percent over districts which were not represented.

The difference in results may be partially explained by the increase in collective bargaining over the last decade. Lipsey and Drotning (1973) report that in 1970 63 percent of the districts in New York had some form of formal collective bargaining unit.[10] In 1977-78, the NEA tabulations show over 94 percent of the district represented. Furthermore, a substantial number of these non-bargaining districts are in heavily populated counties. We, therefore, may be observing a spillover effect in which administrators in non-bargaining districts attempt to match the salary increases of bargaining districts within their immediate vicinity in order to discourage the introduction of full-scale collective bargaining into the district. Chambers[11] and Ehrenberg and Goldstein[12] show that the regional effect, or geographic spillover effect, of unionization is quite widespread. In fact, Chambers found that the regional effect accounted for most of the difference in salaries between unionized and non-unionized public school districts in California.

For whatever reasons non-bargaining districts have higher average salaries, we find that these districts are trading higher salaries for smaller teaching staffs since the teacher student ratio is observed to fall. The increase in average salaries appears to be completely offset by a reduction in teachers since total salaries per pupil are unaffected by the non-bargaining variable.

Despite the fact that non-bargaining districts have a lower teacher

student ratio and higher average salaries than other districts, and the fact that NEA districts have a higher teacher student ratio, a lower percentage of teachers with masters, and slightly fewer dollars spent for administration, the differences between these three types of districts are very slight. We will, therefore, drop this distinction for the remainder of the analysis.

The Number of Contract Items and Resource Allocation

Contract items place constraints upon the decisions of school administrators. Some contract items specify upper and lower limits on the amount of resources employed. Class-size limitation provisions and teacher aide provisions are good examples of resource specific items. A second type of contract item is one which establishes the procedure by which certain resources are allocated. Reduction-in-force provisions are examples of this type of constraint. These provisions establish procedures and criteria, usually based on seniority, by which teachers are layed-off.

Administrators can avoid the full impact of the constraints by substituting away from the constrained input. For example, administrators may attempt to reduce costs but still comply with the class-size limitation provision by employing teacher aides in place of certified teachers. If a teacher aide provision is also included in the contract which limits the duties of the aide to non-professional activities or even the number of aides, then the administrator does not have the available option of substituting aides for teachers in order to attempt to reduce costs. As the number of constraints facing the administrators increase, the level of administrative discretion decreases. The number of contract items in the contract is a relatively good proxy for the level of constraints placed on

the administration. The number of constraints also provides a measure of the preferences of the collective bargaining unit. Contracts are the result of negotiations which embody the preferences of both parties. The extent to which the contract reflects the preferences of one group over the other depends upon the relative bargaining strength of each. Many of the individual provisions are placed in the contract at the request of the teacher representatives in order to insure that the administration complies with the preferences of the majority of teachers. Although it is impossible from looking only at the number of contract items to tell whether the provision actually satisfies the preferences of the teachers, it is reasonable to assume that the greater the number of contract items the more the teacher preferences are satisfied. Furthermore, districts with more contract provisions have probably bargained longer than districts with fewer provisions and over time teachers have been able to carve out provisions to protect their interests.

If contract items constrain administrators to comply with the desires of teacher collective bargaining units then we would expect resources to be allocated more to the benefits of teachers. For instance, we would expect districts with greater than average number of contract items to allocate more resources to instructional expenses since instructional expenses include teacher salaries. An increase in instructional expenses also affects the working conditions of teachers through a larger teacher student ratio and more materials and supplies for instruction. Teachers may also prefer higher expenditures on employee benefits at the expense of administration expenses, maintenance, transportation and certain special services.

The number of contract items contained in each district contract is

calculated by adding up the "yes" responses to the list of items in the NYSUT analysis. Therefore, if we find that the contract in district A contains a provision to limit class size, a provision to establish an educational policy committee, and provide personal days, and the contract was silent on all other items, then the contract would be given a score of three. Figure 4-1 shows the distribution of the number of items in each contract for the entire sample. The number of items is normally distributed with a minimum of 4 items present in a contract, a maximum of 50, and a mean of 26.7.

We have hypothesized that the number of contract items affects the allocation of educational resources by constraining the discretion of the administration when allocating the budget. In order to measure this effect, the contract variable will be entered as an interaction term with the total operating budget per pupil variable. In this form, the budget coefficient is written as a function of the number of contract items. That is,

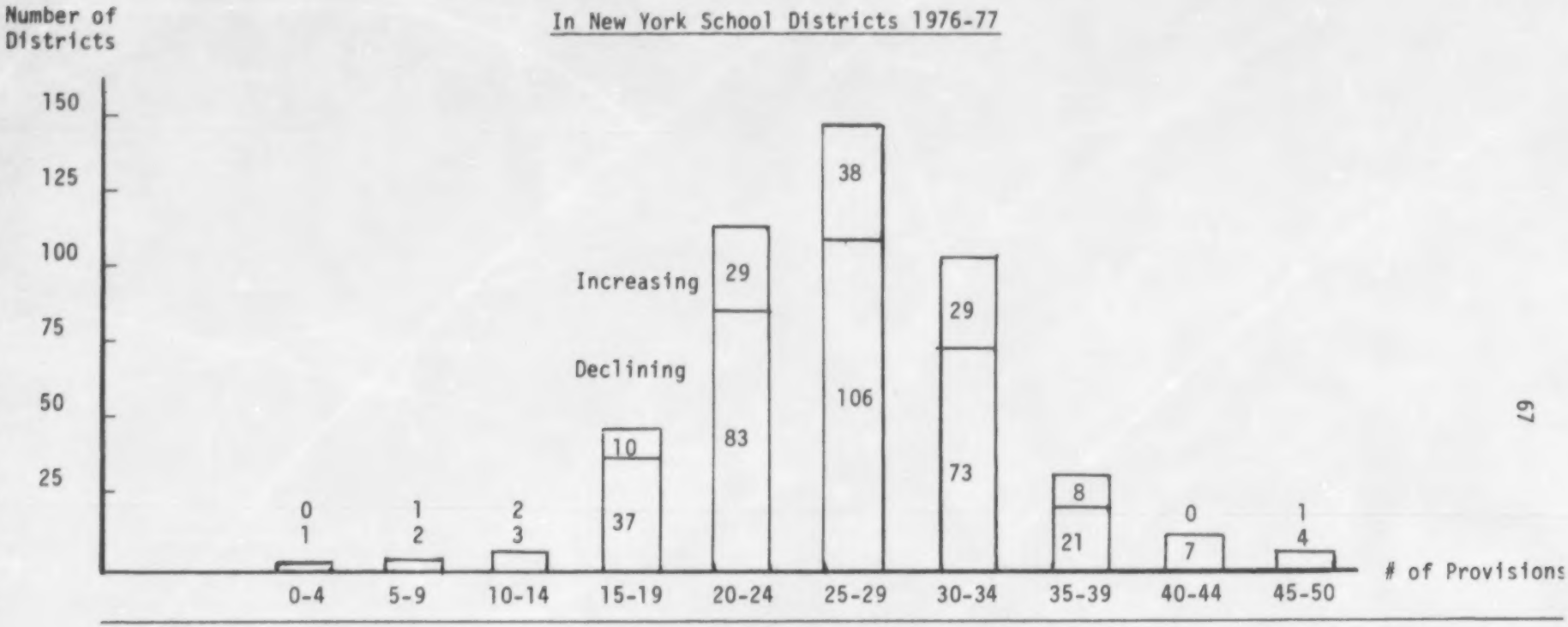
$$\alpha = \beta_o + \beta_1 S$$

where β_o is the coefficient on the budget variable and β_1 is the coefficient on the interaction term. If an increase in the total operating budget per pupil brings about an increase in all inputs and financial categories, then a positive coefficient on the interaction term (β_1) can be interpreted to mean an even greater increase in allocation for those districts with higher than average number of contract items. A negative coefficient on the interaction term indicates that fewer dollars per pupil are allocated in districts with higher than average number of contract items.

Figure 4-1

Frequency Distribution of The Number of Contract Items

In New York School Districts 1976-77



	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-50	
Totals	1	3	5	47	112	144	102	29	7	5	
%	0.2	.7	1.0	10.0	25.	32.	22.	6	2	1	
Declining Enrollments	0	.1	1.7	8.5	24.6	32.2	21.7	6.2	2	1.9	N=337
Increasing Enrollments	0.3	.6	0.1	11.0	24.6	31.5	24.5	5.8	0	0.8	N=118

Table 4-8 shows the estimates of the coefficient of the total operating budget per pupil (β_o) and the number of contract items (β_1). We find that the number of contract items significantly affects the allocation of resources within a number of categories. Districts with higher than average number of contract items increase allocation of funds to instructional, employee benefits, salaries, and decrease expenditures on the "other" category. Estimates of the interaction term for these demand equations are all statistically significant at the .01 level. We also find that the level of average salaries is significantly affected when the number of contract items is entered as an independent variable.

Table 4-8

Impact of the Number of Contract Items on the Budget Elasticities of Educational Resources, New York 1976-77

	Inst/Pupil	Adm/Pupil	Ben/Pupil	Other/Pupil	Ave Sal	Teacher/Pupil	Sal/Pupil
Budget Elasticities	.82 (31.66)	.66 (2.51)	.84 (25.03)	.99 (12.58)	.42 (8.11)	.31 (9.23)	.79 (21.99)
Impact of Number of Contract Items on Budget Elasticities	.002 (3.99)	.010 (1.55)	.002 (2.11)	-.007 (3.94)	-.003 (2.44)	-.001 (1.26)	.002 (2.05)
R^2	.92	.34	.86		.60	.37	.85

The magnitude of the impact of the number of contract items on resource allocation can be illustrated by translating the coefficients into dollar values. Table 4-9 shows the distribution of an increase of $1 of total funds to the various categories for districts with various numbers of contract items. For example, districts with four items will allocate $0.45 per pupil for instructional, $0.02 per pupil for administration, $0.125 per pupil for employee benefits, $0.26 per pupil for teacher salaries, and $0.22 for "other" expenses for every $1 per pupil increase in total operating funds. Districts with the average number of contract items, 26, allocate 2 cents more per pupil for instruction, a half a cent more for employee benefits, almost 2 cents more per pupil for teacher salaries while granting no increase to administration but cutting the "other" category by more than 3 cents per pupil. The trend continues for districts with higher than average salaries. Districts with 50 contract items allocate 50 cents per pupil to instructional, an increase of more than 5 cents over districts with the minimum number of contract items. The administration per pupil allocation remains the same while the allocation to employee benefits increases only slightly.

The average teacher salary also is affected by the number of contract items. Teachers in districts with 50 contract items receive on average $1,855 more than districts with the minimum number of items.

The findings appear to be consistent with the hypothesized influence of contract items. Two effects were discussed earlier. The first is to constrain the allocation decisions of the administration. The second effect is to allow teachers a voice in the way in which resources are allocated. The first effect, taken alone, does not indicate the direction

Table 4-9

Impact of the Number of Contract Items on the Distribution of an Additional Dollar of Expenditures

	Resource Allocation						
Number of Contract Items	Inst/Pupil	Adm/Pupil	Benefits	Other	T/S	Sal/Pupil	Ave. Sal
Low (4)	.456	.02	.125	.22	.051	.26	13,740
Ave (26.7)	.47	.02	.130	.187	.051	.276	14,624
High (50)	.50	.02	.135	.152	.051	.29	15,595

in which the impact should occur. The second factor, however, provides some clues. We would expect that if contract items reflect the preferences of teachers, greater number of items should direct resources towards instructional purposes, increase teacher benefits and salaries, decrease expenditures on administrative functions, and at least not increase the allocation to "other" categories. We find this pattern of results emerging in the estimates. Furthermore, we see that since the teacher student ratio remains unaffected by the number of contract items, the increase in average salaries, and salaries per pupil are achieved not at the expense of smaller teacher staffs but at the expense of the "other" category.

The Number of Contract Items and the Level of Spending for Education in a Community.

Teacher bargaining organizations not only affect the internal allocation of funds as previously shown, but also have the potential to influence the allocation of funds within the community. Since teachers recognize that larger budgets lead to an increase in instructional expenses, salaries, benefits, and larger teaching staffs, the collective bargaining units will find it worthwhile to promote an increase in the total operating budget for the school district. Many avenues of collective influence are open to the teachers. Teachers will align themselves with the administration since both parties tend to be strong proponents of larger school budgets except perhaps when a superintendent is hired with a clear mandate to decrease spending. The primary opposition to increased spending are members of the school board who may feel that they were elected in order to curb the spending of taxpayers' money. Teacher unions may combat this opposition through political pressure, moral suasion, or the threat of disruption of service which would make the school board appear ineffective in the management of the public schools.

Besides the influence of teacher organizations on school budgets, other factors affect the level of spending. Districts which are education-minded may be willing to spend more on public education. Families with many children should find a greater benefit per tax dollar in spending for education since their support of public education is not directly based on the number of children in school. Also, communities with a higher proportion of families with children should also provide greater financial support for school. The total operating budget per pupil is also affected by state aid equalization programs and federal support of federally mandated programs.

The impact of the number of students in a district on per pupil spending will depend upon whether public education is subject to economies of scale. Economies of scale will occur in a labor intensive service sector, such as education, primarily through the specialization of certain personnel. For example, small districts may not have sufficient demand for the full-time services of a reading specialist and would prefer to fill that position with a part-time teacher. However, especially in times when specialists are in relative short supply, part-time teachers may not be available and the district will have to employ the teacher full-time or go without the services. The latter option may not be feasible since many states require that schools provide special services to qualified students. Larger districts, on the other hand, may have sufficient demand to keep a full-time reading specialist busy. Thus, the cost per pupil of the larger district is lower than the cost per pupil in the smaller district.

The estimated effects of the various factors on the determination of the total per pupil operating budget are displayed in Table 4-10. The empirical results indicate that public school districts are subject to economies of scale since the coefficient of the enrollment coefficient is negative and statistically significant at the .10 level. The positive coefficient on the enrollment squared variable completes the picture of economies of scale by indicating that the decrease in total operating budget per pupil flattens out as the enrollment increases. The budget per pupil decreases, however, throughout the entire range of district enrollment in New York state, excluding the New York City School District.

Community characteristics appear to have little effect on school spending. All estimates except for the percentage of families with children fail to be statistically significant at any acceptable level.

Table 4-10

Total Operating Budget Per Pupil in
New York School Districts, 1976-77

Explanatory Variables	Coefficient Est.		Means	Std. Dev.
I	47514.4	(4.73)		
Enrollment	-.56	(1.65)	3359	3567
$(\text{Enrollment})^2$	.000032	(2.79)	23987250	90365530
% Welfare	-724.81	(1.28)	2.68	1.01
% Parents College	5336.05	(.94)	.28	.13
Family Size	-2778.6	(.69)	2.45	.18
% Families w/ Children	-26362	(2.29)	.57	.06
State Aid p/Pupil	.88	(26.08)	1094.74	280.54
Fed Aid per Pupil	.65	(2.93)	5.91	24.16
Property Tax Rev. per Pupil	.94	(65.61)	579.90	585.25
Number of Contract Items	157.40	(1.58)	26.67	6.39
R^2	.95			
F	873.64			
Mean	2171.21			

The sign on the families with children is puzzling since it does not conform with our expectations.

The three revenue variables yield statistically significant estimates. We find that increases in the various sources of school revenue have different impacts on the increase of the total budget. A $1 increase in revenue per pupil from property taxes increases the total operating budget

per pupil by $.94. A dollar increase in state aid per pupil increases school spending by $.88 per pupil while a dollar increase in federal aid increases school spending by only $.65. If each of the three sources of revenue increased by one dollar, we would expect the total operating budget per pupil to increase by $3 instead of the $2.47 that we observe. The missing $.53 can be accounted for in the substitution between the various sources. For example, a portion of the $1 per pupil received from the federal government may be used to reduce the amount of money needed from local property tax sources. The same is true for state aid but to a smaller extent.

The number of contract items has a positive effect upon the level of per pupil spending. This is consistent with our hypothesis of the potential effect of teacher organizations. The results are shown in Table 4-11. Although the estimate is not statistically significant at the .10 level, it is interesting to compute the level of spending for districts with different contract characteristics. Districts with the minimum of 4 contract items will spend on average $2135 per pupil while districts with the mean number of contract items (26) will increase their per pupil spending by $36 to $2171. Districts with the maximum number of contract items increase their per pupil spending by another $36 to $2207. Clearly, teachers are exercising some influence on the size of the school budget in order to promote their own interests.

Table 4-11

Effect of the Number of Contract Items on School Spending

Number of Contract Items	Operating Expenditures Per Pupil
4	2,135.80
26	2,171.48
50	2,208.20

Individual Contract Items and Resource Allocation

The impact of the scope of the contract on the allocation of resources within public school districts is the result of individual provisions constraining the behavior of the administration. We have postulated that scope of the contract reduces the discretion of the administration while at the same time increases the influence of the teachers. Sheer numbers may not be the only reason for the significant relationship between scope and resource allocation. It may also be the case that a hierarchy of contract items may exist. That is, districts which have only a few items will have the same items and additional items are added to all contracts in the same order.

For example, the first item to be negotiated by a bargaining unit which has just been established in a district may be the grievance procedure, and after this, a means of settling negotiation deadlocks such as binding arbitration. Also, one of the first steps is to define the

bargaining unit and immediately after this, provisions for sick leave and provisions to supervise the conduct of personnel. The order in which these items are entered on the contract is dependent upon the preferences of the teachers and administrators and the relative bargaining power possessed by each.

If a hierarchy is present in New York district contracts, then the scope measure used in the previous analysis may be measuring the presence of certain contract items which significantly affect the allocation of resources.

The contract items can be grouped into four major categories. Table 4-12 shows the items included in each group and their respective frequencies of occurrence. The first group contains items relating to arbitration and grievance matters. Except for maintenance of standard clauses, over 80 percent of the districts contain provisions of this type. Moreover since virtually every contract contains a grievance provision, this will be excluded from the analysis.

The second group of contract provisions addresses labor jurisprudence issues. These include provisions on staff reduction, recall to position, seniority, dismissal, and severance pay. Provisions included in this group define the procedures by which the administration will layoff and dismiss teachers. Provision 55 establishes whether the contract contains a staff reduction procedure and then Provisions 57 and 62 reveal whether the procedure is based on seniority and whether severance pay is forthcoming. Provision 58 indicates whether a procedure exists to reinstate teachers once they are layed off. The remaining items deal with dismissal procedures unrelated to financial or declining enrollment problems.

Table 4-12

New York Public School Contract Items

	% of Contracts With Items
A. Arbitration and Grievance	
Final stage-binding arbitration (9)	83
Evaluation Procedures for Teachers (38)	87
Maintenance of standards (30)	12
B. Labor Jurisprudence	
Staff reduction procedure (55)	37
Recall to position (58)	12
Seniority clause (57)	18
No reduction during contract (56)	04
Dismissal for just cause:	
tenured only (61)	38
non-tenured only (59)	39
probationary teachers only (60)	27
Severance pay (62)	02
C. Working Conditions	
Class size (40)	56
Teacher preparation provision (53)	71
Education policy committee (44)	39
Tuition reimbursement (42)	04
Inservice provision (20)	40
Summer sabbaticals (6)	16
Number of aides specified (19)	03
D. Employee Benefits	
Personal days (65)	95
Pregnancy (68)	24
Religious holidays (69)	34
Jury duty (70)	68
Sick leave bank (76)	34
Retirement compensation provision (77)	42
Health insurance (82)	97
Dental insurance (83)	35
Life insurance (84)	23
Disability insurance (85)	13

The third group of contract items defines the working conditions of the teachers. The questions address whether contracts contain a provision to limit class size, guarantee teacher preparation periods, provide in-service programs and establish educational policy committees. The most frequently provided item in this group is the teacher preparation provision. A class size provision is found in 56 percent of the contracts and inservice provisions and educational policy committees in roughly 40 percent. The least commonly provided item is the reimbursement of tuition expenses for continuing teacher education.

The fourth group of contract items relates to employee benefits. These include provisions defining the number of personal days, whether leaves will be granted for pregnancy, jury duty, and religious holidays, and the establishment of a sick leave bank and retirement compensation. Provisions in this group also designate whether health insurance, dental insurance, life insurance, and disability insurance are provided by the district. The two most frequently found items in this group are personal days (95 percent) and health insurance (97 percent). Provisions to grant leaves for jury duty are found in over half the contracts while pregnancy and religious holiday leaves are granted in one third the districts or less. Although most districts provide a group health insurance plan, very few provide life and disability insurance while one third provide dental insurance.

The impact of these individual contract items on the various financial categories and teacher attributes can be expected to be varied and complex. As mentioned in the theoretical chapter, individual contract items can potentially affect the allocation of resources by specifying the amount of a resource that must be provided. For example, we would expect

that districts which provide tuition reimbursement to allocate more funds to instruction and/or employee benefits since the funds for tuition reimbursement may come from either of these categories. In order to be able to repay teachers for tuition costs, districts will either have to increase the total operating budget or reduce expenditures in another category. It is difficult, a priori, to determine which of the other resources will be sacrificed in order that teachers can be reimbursed. Teachers may be willing to forego their preparation period or even may accept increased teaching assignments.

A third possibility would be a reduction in salaries. However, all these possibilities include working conditions which teachers value and which they may negotiate provisions to protect. If provisions insuring that teachers' working conditions are not reduced are contained in the contract, then the administration has no choice but to reduce spending on categories which are not valued by teachers this may include administration expenditures or expenditures on resources contained in the "other" category.

We should also point out that not every contract item reflects the preferences of teachers. Some items may be included at the request of the administration. Even though the item may limit the discretion of the administration, this may be preferred in order that the prescribed behavior can be justified by its inclusion in the contract. For example, the administration may want to establish certain criteria for evaluating teachers. If this criteria passes the scrutiny of the teachers during the bargaining process, then the administration can claim that teachers have accepted their criteria. The same may be true for educational policy committees. The committees may be initiated by the administration in

order to demonstrate that teachers do have an active role in policy decisions since a committee exists. The actual power of the committee to establish policy is not guaranteed by its mere existence. Thus, we must take into consideration that the items may represent the preferences of the administration as well as the teachers when interpreting the results.

In order to measure the impact of individual contract items on the allocation of resources, each item is entered separately into the input demand equations as an interaction term with the total budget variable. The reasoning behind this approach has been explained in the previous chapter. In this way we can examine the effect of each item on the allocation of the total budget to the various budget categories. The empirical results measured in dollar amounts are shown in Table 4-13. Although each demand equation is estimated for each contract item, we display only the estimates of the interaction term. The estimates of the interaction term can be interpreted to be the difference in allocation of districts with and without the contract item.

For example, we have shown that for every one dollar per pupil increase in total operating budget, $0.48 goes to instruction. We find, however, that district with a staff reduction procedure allocate one cent more to instruction for every one dollar increase in spending than districts without the staff reduction procedure. Since the input demand equations control for student and community characteristics, all these factors have been taken into consideration when estimating the impact of the contract item. The estimates for every budgetary category are expressed in dollar terms. The estimates of the teacher student ratio and the average teacher salary are expressed in elasticities since dollar changes do not make much sense. The elasticity estimates for each contract item are to be

Table 4-13

Impact of Individual Contract Items on the Allocation of an Additional Dollar to Various Resource Categories*

	Inst/Pupil	Adm/Pupil	Benefits/P	Other/Pupil	Salaries/P	T/S**	Ave Sal**
9	-.010 (1.65)	-.002 (.81)	-.002 (.10)	-.003 (.22)	-.004 (.98)	-.013 (1.21)	-.009 (.50)
38	-.004 (.76)	.009 (1.99)	-.0014 (.80)	-.0024 (.32)	-.009 (2.03)	.0015 (.13)	-.015 (.83)
30	.005 (.88)	.005 (1.45)	.006 (.34)	-.017 (2.01)	-.0016 (.34)	-.0047 (.38)	.006 (.32)
55	.011 (3.03)	-.0007 (.67)	.003 (2.01)	-.020 (3.64)	.0075 (2.42)	.007 (.78)	.032 (2.43)
58	.011 (1.96)	.001 (.37)	.002 (.77)	-.016 (1.92)	.0060 (1.26)	.0001 (.005)	.040 (1.96)
57	.001 (1.99)	.001 (.51)	.00002 (.01)	.01 (1.48)	.004 (1.07)	.013 (1.28)	.025 (1.49)
56	-.0007 (.08)	.004 (.78)	.005 (1.82)	.0003 (.02)	.003 (.40)	-.033 (1.61)	.046 (1.39)
61	-.002 (.51)	-.004 (2.05)	-.0013 (.99)	.004 (.73)	-.004 (1.29)	.010 (1.18)	-.004 (.31)
59	-.0009 (.23)	-.004 (2.01)	.001 (1.04)	.0024 (.45)	-.004 (1.29)	.009 (1.09)	-.002 (.17)
60	-.000 (.02)	-.003 (1.18)	-.002 (1.16)	.003 (.50)	-.002 (.56)	.007 (.72)	.006 (.32)
62	.018 (2.14)	.004 (.81)	.002 (.54)	-.024 (1.88)	.010 (1.36)	-.006 (.32)	.040 (1.32)
40	.0003 (.08)	.0003 (1.15)	.013 (1.20)	-.007 (1.24)	.001 (.44)	-.008 (1.04)	.004 (.28)
53	.004 (1.02)	.0007 (.29)	.00006 (.04)	.0000 (.0003)	-.004 (1.17)	.001 (.12)	-.013 (.84)
44	.0006 (.16)	-.001 (.56)	.0006 (.49)	-.0013 (.24)	-.0002 (.06)	-.009 (1.14)	-.006 (.45)
42	.015 (1.96)	.003 (.59)	.006 (2.37)	-.029 (2.56)	.012 (1.90)	.019 (1.10)	.031 (1.10)

Table 4-13 (con't)

	Inst/Pupil	Adm/Pupil	Benefits/P	Other/Pupil	Salaries/P	T/S**	Ave Sal**
20	.0006 (.17)	.0001 (.04)	-.001 (.85)	-.0028 (.52)	-.002 (.50)	.006 (.71)	.003 (.27)
6	.002 (.65)	-.001 (.51)	-.0008 (.52)	.006 (.87)	.0025 (.65)	-.007 (.70)	.013 (.77)
19	.008 (.65)	-.003 (.38)	-.003 (.58)	.0084 (.45)	.008 (.77)	-.002 (.07)	.008 (.17)
Coefficient of Budget Variable	.48	.03	.13	.18	.29	.22 (Elasticity)	.44
Mean	1194.00	65.74	325.32	505.13	728.82	.051	14,833

* Estimates are computed in dollar amounts and T statistics are given in parentheses.

** Estimates of these categories are measured as elasticities.

interpreted relative to the budgetary elasticity listed at the bottom of the respective columns.

For example, we found earlier that a one percent increase in total per operating expenditures brings about a .22 percent increase in the teacher student ratio. We find that districts with the class size reduction provision have a slightly lower budget elasticity than districts without the provision. If the estimate of the interaction term were statistically significant then we could conclude that the class limitation provision reduces the increase in the teacher student ratio forthcoming from an increase in the budget.

The effect of individual contract items on average teacher salary can be interpreted in a similar manner. For example, we find that the recall to position provision increases the budget elasticity of average salary by .04. Therefore, districts which have the budget provision will have a budget elasticity of .48 compared with a budget elasticity of .44 for those without the provision. Average teacher salary will be more sensitive to budget increases in the former districts than the latter.

Now that we have established how to interpret the empirical results, we can examine differing effects of the various contract items on the allocation of the district budget. Before examining the results, it should be mentioned that the contract items associated with employee benefits have not been included in the analysis. These are excluded since they are considered part of the teacher compensation package and thus should effect primarily the level of teacher salary and employee benefit expenditures. The impact of these items on salaries and benefits will be considered later in the chapter.

In examining the results we find that many of the estimates are not statistically significant at a reasonable level of confidence. However, a closer look reveals that estimates of 11 of the 18 contract items are statistically significant at the .10 level for at least one of the resource categories. The pattern of significance reveals that all items in the arbitration and grievance group have estimates which are statistically significant while all but one item in the labor jurisprudence group are statistically significant. The working conditions category contains only one item which is statistically significant with all the others failing the test.

Arbitration and Grievance Items

The impact of the items within this group is mixed. Districts with the binding arbitration provision allocate fewer dollars to instruction than districts without the provision. Districts with evaluation procedures and maintenance of standard clauses show no difference in the allocation of funds to instruction than districts without these provisions. The impact of the evaluation provision is found in the allocation of funds to administration and teacher salaries. It appears that districts which evaluate teachers spend more on administration at the expense of teacher salaries. Furthermore, the increase in administration expenses is completely offset by the same dollar decrease in salaries.

If teachers are promoting evaluation procedures then, it appears that they are willing to accept a slight decrease in the overall expenditure on salaries for this service. On the other hand, if the administration is the primary advocate of teacher evaluations, then the administration's preferences are met at the expense of the teachers. The maintenance of standard clause does not appear to benefit teachers in either salary

increase or class size reduction. It does appear, however, to increase expenditures on administration even though the estimate is not statistically significant at the .10 level. The increase in administration is achieved at the expense of expenditures on "other" functions. If teachers derive benefits from services provided by the "other" category, then this clause may be detrimental to the working conditions of teachers.

Overall, the results show virtually no benefit accruing to teachers from the presence of either one of these provisions. In fact, it appears that teachers are sacrificing compensation and expenditures on working conditions in order to maintain arbitration and grievance provisions.

Labor Jurisprudence Items

Contract items related to labor jurisprudence issues appear to provide certain benefits to teachers. We find that all items which are statistically significant increase the allocation of funds to instruction. Allocation of funds to employee benefits are also increased due to the presence of contract items as are the allocation of funds to teacher salaries. In order to compensate for these increases, less funds are allocated to administration and the "other" category.

In particular, we find that districts with a staff reduction provision allocate $.01 per dollar of total operating expenditures more to instructional than districts without the provision. The increase in instructional expenses goes primarily to salary increases for teachers and no significant portion is spent to increase the teacher student ratio. Accompanying the increase in salaries per pupil is an increase in expenditures on employee benefits. The increase in expenditures on instruction and employee benefits are more than compensated by a decrease in the expenditures on inputs in the "other" category.

The presence of a reduction in force procedure only indicates that some methodical procedure will be followed when staff reduction is necessary. Two criteria of staff reduction are described in the contract. The first is a procedure based on seniority and the second is no reduction at all during the length of the contract. We find that about half of the districts have a reduction in force procedure based on seniority and about 12 percent have no reduction in force procedure.

The seniority clause appears to increase instructional expenditures by $.01 for every $1 increase in total expenditures. The increase in instruction is shared equally by an increase in teacher salaries and an increase in teacher student ratio, although neither estimate is statistically significant. A no reduction clause has little affect on instructional expenditures but primarily increases expenditures for employee benefits.

A curious finding is the negative impact of the no reduction clause on the teacher student ratio. The results show that districts with the clause have a lower teacher student ratio than districts without the clause. This may be an example of the problems of interpreting results from cross-sectional analysis. Cross-sectional analysis only permits the comparison of districts with a contract item and districts without the item. We have no time sequence from which to infer a direction of causation. We do, however, draw causal conclusions by postulating that contracts are exogenous to the decision-making process. That is, contracts affect the allocation of resources and the allocation of resources do not significantly affect the appearance of a contract item. Although our analysis of the determination of contract items shows that this is usually the case, it does not always hold. Therefore, we may be observing the situation in which districts with smaller teacher student ratios are able to negotiate the no

reduction clause in the contract since a reduction of one teacher will significantly affect the entire teaching staff whereas larger districts will not be as greatly affected.

Districts which provide severance pay for laid-off teachers allocate more funds to instructional at the expense of resources in the "other" category. The increase in instructional funds are used for the additional compensation of teachers at the time they leave the district for reasons other than retirement.

Besides adopting procedures to lay off teachers, some districts have methods for possible reinstatement of staff who have been laid off as a result of reduction in force. Although only 12 percent of the districts contain this provision, districts which posess the item allocate more funds to instruction but less to employee benefits. The results in Table 4-13 show that for every $1 increase per pupil in the total operating budget, an additional cent is spent on instruction in districts with a recall provision compared to those without. The increase in instructional expenses are completely offset by a decrease in expenses in the "other" category. The additional increase in instructional expenses goes primarily to teacher salaries with no significant effect on the teacher student ratio.

Labor jurisprudence contract items also address the dismissal of teachers for reasons other than financial. District contracts contain provisions which insure that teachers will not be dismissed except for just cause. The contracts do not state what the causes are but do list which teachers are protected. We find that 38 percent of New York districts contain this provision for tenured teachers, 39 percent for non-tenured, and 27 percent for probationary teachers. The effect of

these three contract items are very similar. The only statistically significant coefficient estimate is found for administration expenditures. In all three cases, the presence of a dismissal clause decreases the allocation of funds to the administration.

Working Conditions

Districts contain contract provisions which relate to the working environment of the teachers. We have analyzed the impact of a number of contract items but find that very few have any significant impact on the allocation of resources. Only the tuition reimbursement item yields statistically significant coefficient estimates. We find that districts which reimburse teachers for tuition costs allocate more funds to instruction, more to employee benefits and fewer funds to resources in the "other" category. The primary reasons for these increases, of course, is to account for the extra compensation given teachers. New York districts include tuition reimbursement under the instructional expenditures category. The slight increase in expenditures on employee benefits is difficult to account for unless we find that districts which spend a higher proportion of the total budget on employee benefits also reimburse teachers for tuition costs.

Employee Benefits

Teacher contracts specify a number of items which relate to their compensation package. These benefits are different from working conditions in that they are private benefits and not the public or collective benefits associated with working conditions. For example, the class size provision is a public benefit since all teachers in the school are affected whereas the provision of life insurance is accrued as a private benefit. Items

included in this group are not necessarily attained only through collective bargaining. Many districts which are not organized provide teachers with certain fringe benefits as a general personnel policy.

Since employee benefits such as the various insurance policies are provided at no charge or a nominal fee to the teacher, we expect to find that expenditures on salaries and employee benefits should increase in districts with these provisions. In the accounting system established by the state for New York public schools, most expenses for insurance policies are entered under employee benefits. Therefore, any cost to the district should be observed within this category.

The results in Table 4-14 show that districts which provide insurance coverage to teachers have higher expenditures on instructional or employee benefits than districts which do not have these provisions in the contract. We find that districts which provide life insurance policies spend roughly $10 more per pupil on employee benefits than districts without this provision. Dental insurance requires an expenditure of approximately $8 per pupil more. Life insurance also increases expenditures on instruction by $37 and disability by $38 per pupil. The impact of these provisions on instructional expenditures is curious since according to the accounting ledgers, these benefits should not be paid through this account. We may be observing another case in which the direction of causation is not as anticipated. Instead of the presence of contract items determining the allocation of resources, we may find that the allocation of resources determines the presence of contract items. In particular, districts with higher expenditures on instruction may be more inclined to provide insurance benefits for teachers than districts with lower expenditures.

However, when we examine the impact of these provision on the individual salaries of teachers, not the district average, we find that teachers employed by districts which provide life and health insure are paid less in take-home salary than districts which do not provide this coverage. After adjusting the salary level of each teacher for their level of experience and education, sex, and the characteristics of the district and community, we find that districts with life insurance deduct $708 from the teacher salaries and districts with health insurance pay $1143 less per year.

Table 4-14

Effects of Exmployee Benefit Provisions on Resource Allocation in New York School Districts, 1976-77

Contract Provisions	Inst/Pupil	Salaries/P	Benefits/P	Other/P	Av Sal	Individual Teacher Salaries*
Personal Days	-.026 (.95)	.007 (.33)	-.002 (.10)	.034 (.26)	.039 (1.17)	-17.23 (.12)
Pregnancy	-.009 (1.13)	.007 (.70)	.011 (1.15)	.002 (.16)	.014 (.90)	-97.05 (1.38)
Religious Holiday	.011 (1.48)	.004 (.40)	.014 (1.49)	-.09 (1.53)	.0007 (.05)	-245.7 (2.87)
Jury Duty	.007 (1.04)	.006 (.58)	-.007 (.75)	.038 (.68)	-.005 (.34)	876.27 (12.53)
Sick Leave Bank	-.007 (1.09)	.003 (.28)	-.014 (1.57)	.074 (1.39)	.007 (.52)	509.43 (8.05)
Retirement Comp.	.0003 (.05)	.012 (1.27)	.012 (1.36)	-.005 (.09)	.019 (1.39)	-289.68 (3.61)
Health Ins.	-.008 (.43)	-.07 (2.58)	-.026 (1.09)	-.077 (.53)	-.050 (1.32)	-1143.15 (6.55)
Dental Ins.	.008 (1.06)	.013 (1.21)	.023 (2.39)	-.05 (.98)	.029 (1.89)	1519.05 (17.77)
Life Ins	.03 (3.11)	.039 (3.09)	.028 (2.38)	-.23 (3.22)	.037 (2.00)	-708.90 (7.17)
Disability Ins	.021 (1.89)	.013 (.85)	.0001 (.02)	-.087 (1.03)	.010 (.45)	454.17 (5.05)
R^2	.92	.86	.87	.13	.60	.77

*Computed from individual teacher salaries.

Collective Bargaining in Declining Enrollment Districts

One of the most pressing problems facing many school districts across the country is the decline in the number of school-age children. Districts that only a short while ago were complaining of an acute shortage of teachers are now faced with too many tenured teachers, too many schools, and too few students. Furthermore, taxpayers who have fewer children to educate are more reluctant to grant budget increases to public schools even though the costs of education continue to climb. The combined decrease in enrollments and lack of financial support have forced many districts to close neighborhood schools, lay-off teachers, and cut out extracurricular activities.

Districts in the state of New York are no exception to the general trend of declining enrollments across the country. Between 1972 and 1977, total enrollments in the state, excluding New York City, fell from 2,363,510 students in 1972 to 2,232,380 students, a reduction of a little over 131,000 students. The number of classroom teachers in public schools over the same period dropped by almost 13,000 from 181,558 in 1972 to 168,814 in 1977. However, the decrease in the number of students was not uniform across all grades. Although the number of students in grades K-6 decreased from 1,281,400 to 1,118,889 the number of students in grades 7-12 increased by over 31,000. Moreover, not every school district experienced enrollment declines. Approximately 26 percent of the public school districts with grades K-12 experienced increasing enrollments. Districts with increasing enrollments are found primarily in less urbanized areas than districts with declining enrollments.

The decline in enrollments has prompted many teacher unions to bargain for provisions which address the problem of staff reduction. Over 42 percent

of the districts which face declining enrollments have provisions which prescribe some orderly procedure of staff reduction. Nineteen percent of the districts base this procedure on seniority and only 4 percent have a no-reduction clause in the contract.

Districts which face increasing enrollments are also concerned about the possibility of staff reductions but to a lesser extent. Only 29 percent of these districts have staff reduction provisions, with 20 percent of the districts basing the procedure on seniority and 3 percent negotiating a no-reduction clause.

Table 4-15 shows that the characteristics of school districts faced with increasing enrollments and those experiencing decreasing enrollments are somewhat different. We find that the average enrollment of the two types of districts to be about the same with declining enrollment districts slightly larger by 100 students. Declining enrollment districts also have larger teaching staffs. A greater percentage of teachers in declining enrollment districts have masters degrees, 69 percent compared with 66 percent, and have on average almost 2 more years of experience, 12.5 compared with 11 years. Furthermore, declining enrollment districts have a slightly larger teacher student ratio.

The numbers appear to indicate that districts facing declining enrollments have been locked into maintaining a slightly larger teaching staff than the average primarily due to the inability to lay-off tenured teachers which could be partly due to the efforts of the teacher unions. Districts experiencing increasing enrollments on the other hand, may be reluctant to hire as many teachers as they normally would in anticipation of facing declining enrollments in the future.

Table 4-15

Mean Values of New York School District Characteristics for Increasing and Decreasing Enrollment Districts, 1976-77

	Increasing	Decreasing
Enrollment	3,376	3,492
Op. Exp/Pupil	2,076.59	2,222.83
Teachers	164	177
Teachers/Std.	.050	.052
Ave. Salary	14,657	15,324
Ave. Experience	10.93	12.50
% Masters	66	69
Inst. Exp./Pupil	1,115.24	1,231.31
Adm. Exp./Pupil	56.47	69.39
Benefits/Pupil	303.64	337.25
Salaries/Pupil	682.54	750.56
% Urban	30	50
% NEA	8	12
% Non-affiliated	7	8
% Traditional	94	95
% Cluster	13	09
% Open	12	12
Benefits/Teacher	6,710.	7,374.
% Instructional Exp.	54	55
% Adm. Exper.	03	30
% Salary (of Inst. Exp.)	61	61
% Benefits	15	15

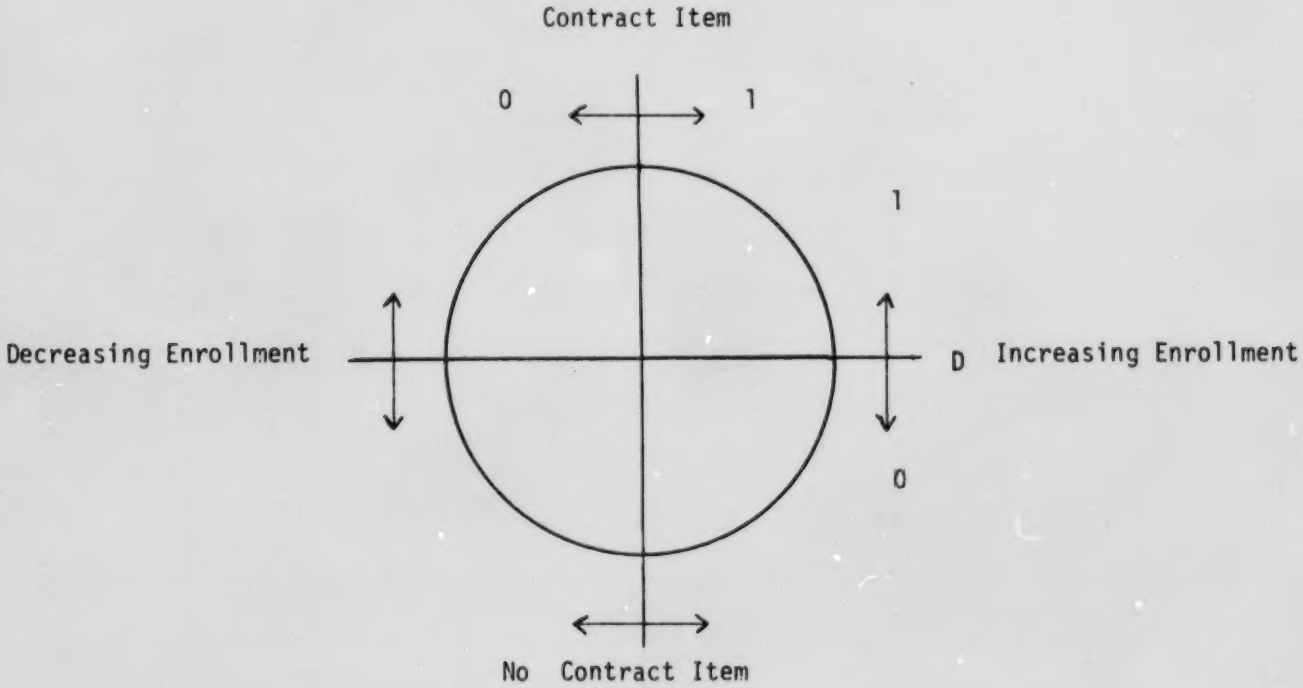
We expect that staff reduction related to contract items should have more of an impact on resource allocation in declining enrollment districts than increasing enrollment districts. We also would expect that if declining enrollment districts must support a larger than normal staff with no significant increase in budget, then other contract provisions may impinge to a greater degree on the allocation of resources.

We can test the effect of declining enrollments on the impact of contract items on resource allocation by distinguishing in the estimation equations between the two types of districts. We have discussed this in some detail in the earlier methodology chapter, and we only review briefly the framework. Unlike the previous section where we looked only at the presence of a contract, we are now concerned with the impact of contract items as well as declining enrollment on the allocation of a $1 increase in the total operating budget per pupil. Consequently, we enter our variables as an interaction term with the budget variable. The interpretation of the signs are the same as before. A positive sign indicates that the presence of the effect is associated with a larger than average allocation of funds to the respective categories. A negative sign indicates a less than average allocation.

The inclusion of two effects into the demand equations introduces four combinations of effects. These can be summarized by considering the diagram in Figure 4-2. In this diagram we have depicted four separate quadrants of events. The northeast quadrant contains the dual presence of the contract item and an increasing enrollment district (Q=1, D=1). Below that quadrant is the quadrant which contains the dual event of the contract item but this time in a decreasing enrollment district. The southwest quadrant represents decreasing enrollment districts which do not

Figure 4-2

The Interaction of Declining Enrollment and Contract Provision



contain the contract item while the southeast quadrant includes increasing enrollment districts without the contract item.

We can measure the effect of certain combinations of effects by considering the difference in means of any two quadrants which share a common border. For example, the difference between the northwest quadrant and the southwest quadrant is the difference in the presence of a contract item. Both contain declining enrollment districts. Suppose that we wanted to compare the difference in the means of instructional expenditures of districts which fall within the two separate quadrants. After correcting the expenditures for other exogenous factors, the comparison yields the effect of the presence of a contract item in decreasing enrollment districts.

The same type of comparison can be done for other pairs of quadrants.

However, instead of examining the means, the analysis looks at the effect of contract items on declining enrollment districts on the coefficient of the budget variable in the input demand equations. This is identical to the procedure in the previous section except that we have added two more variables. The coefficient of the budget variable is written as a function of the event of declining or increasing enrollment, (D), the presence of the contract item (Q), and the interaction between the event D and the item Q. Thus,

$$\alpha = \beta_o + \beta_1 D + \beta_2 Q + \beta_3 (DQ)$$

where α is the coefficient of the budget variable without the additional effects, β_o is the coefficient of the budget variable when the effects are added. The coefficients of the equation are interpreted in the following manner:

1) β_1 denotes the effect of increasing enrollments (D=1) in districts without the contract item.
2) β_2 denotes the impact of the contract item in declining enrollment districts.
3) $\beta_1+\beta_3$ denotes the effect of increasing enrollments in districts with the contract item.
4) $\beta_2+\beta_3$ denotes the impact of the contract item in increasing enrollment districts.

Consequently, we have separated out the effects of contract items in districts facing declining enrollment from districts facing increasing enrollments in accordance with our hypothesis that contract items will be more of a factor in the former districts. At the same time, we can investigate the difference in allocation behavior between districts faced with

decreasing enrollment and increasing enrollment subject to the same constraints imposed by contract items.

The results of the analysis are displayed in Table 4-16. Listed in the table are the estimates of the coefficients of the budget (β_0), the coefficient of the interaction of the event with the budget (β_1), the coefficient of the interaction of the contract item with the budget (β_2), and the interaction of the contract item and event with the budget (β_3).

A number of interesting patterns emerge from the results. First, many of the estimates of β_1 associated with instruction, benefits, and salaries are statistically significant and negative. The estimate of β_1 associated with the "other" financial category are statistically significant and positive. This indicates that districts without any one of the contract items considered allocate more dollars to instructional benefits, and salaries and fewer to "other" when faced with declining enrollments than districts experiencing increasing enrollments. Consequently, districts facing declining enrollments must put forth greater financial effort than districts with increasing enrollments in order to support the teaching staff. This is done primarily at the sacrifice of non-personnel expenditures with no reduction in administrative expenditures found. This is supported by the fact that districts with declining enrollments have larger teaching staffs and larger teacher student ratios than the other districts. Also, declining enrollment districts have a more experienced and more highly educated teaching staff which increases personnel costs.

Examination of the differences in impact of contracts in increasing enrollment districts and declining enrollment districts reveals some interesting results. Contrary to our hypothesis, contract items related to staff reduction and dismissal affect districts facing increasing enrollments

Table 4-16

The Effects of Contract Provisions on Budget Allocations in Declining and Increasing Enrollment Districts in New York, 1976-77

Contract Provisions		Inst/Pupil	Adm/Pupil	Sal/Pupil	Benefits/P	T/S	Ave Sal	Other/Pupil
Final Stage Binding Arbitration (9)	B[1]	..480[5] (49.34)[6]	.030 (5.26)	.290 (33.41)	.130 (38.26)	.283 (12.22)	.436 (14.03)	.192
	D[2]	-.011 (.93)	-.002 (.28)	-.010 (1.29)	-.012 (3.04)	-.027 (1.05)	-.016 (.37)	.033 (1.99)
	Q[3]	-.005 (.93)	-.002 (.66)	-.003 (.85)	-.00098 (.51)	-.011 (1.00)	-.013 (.66)	.007 (.90)
	Q[4]	.010 (.83)	-.0004 (.06)	.003 (.28)	.015 (1.63)	.003 (.12)	.022 (.47)	.0006 (.04)
Evaluation Procedures for Teachers (38)	B	.480 (48.09)	.03 (4.37)	.290 (33.24)	.130 (37.25)	.261 (11.63)	.436 (13.86)	.176 (13.81)
	D	-.020 (1.47)	-.003 (.36)	-.017 (1.57)	-.006 (1.38)	-.033 (1.12)	-.016 (.38)	.031 (1.87)
	Q	-.002 (.35)	.006 (1.91)	-.0009 (1.95)	-.0009 (.47)	.003 (.21)	-.019 (.94)	-.003 (.48)
	QD	-.006 (.05)	.00002 (.002)	1.18E-7 (.73)	.0003 (.07)	.009 (.29)	.022 (.43)	-.002 (.10)
Maintenance of Standards (30)	B	.480 (50.99)	.030 (5.14)	.29 (34.53)	.130 (39.22)	.261 (12.45)	.436 (14.30)	.176 (14.74)
	D	-.020 (5.43)	-.002 (.94)	-.009 (3.48)	-.006 (4.09)	-.030 (3.12)	-.002 (.13)	.031 (5.73)
	Q	-.0007 (.11)	.005 (1.37)	-.007 (1.19)	.001 (.46)	-.015 (1.06)	-.004 (.15)	-.012 (1.51)
	QD	.02 (2.05)	.001 (.17)	.020 (1.95)	.0001 (.02)	.044 (1.62)	.036 (.80)	-.009 (.58)

Table 4-16 (con't)

Contract Provisions		Inst/Pupil	Adm/Pupil	Sal/Pupil	Benefits/P	T/S	Ave Sal	Other/Pupil
Staff Reduction Procedure (55)	B	.480 (49.04)	.030 (5.01)	.290 (32.99)	.130 (37.84)	.218 (11.85)	.436 (13.36)	.182 (14.76)
	D	-.020 (4.16)	.0005 (.17)	-.010 (2.46)	-.006 (3.66)	-.022 (2.00)	.008 (.46)	.027 (4.24)
	Q	.008 (2.03)	.001 (.55)	.006 (1.74)	.002 (1.19)	.048 (.56)	.034 (2.29)	-.012 (2.46)
	QD	.005 (.59)	-.006 (1.78)	.003 (.38)	.001 (.46)	-.007 (.33)	-.004 (.13)	.005 (.45)
Recall to Position (58)	B	.480 (51.44)	.030 (5.28)	.290 (34.68)	.130 (39.56)	.261 (12.39)	.436 (14.56)	.171 (14.43)
	D	-.020 (5.14)	-.002 (.66)	-.011 (3.19)	-.007 (4.46)	-.023 (2.44)	-.001 (.03)	.032 (5.85)
	Q	.006 (1.03)	.003 (.71)	.003 (.53)	.0002 (.10)	.002 (.17)	.032 (1.40)	-.011 (1.35)
	QD	.020 (1.45)	-.006 (.85)	1.79E-7 (1.18)	.005 (1.12)	-.014 (.47)	.034 (.73)	-.020 (1.23)
Seniority Clause (57)	B	.480 (51.23)	.030 (5.28)	.290 (34.75)	.130 (39.47)	.261 (12.39)	.436 (14.53)	.171 (14.42)
	D	-.002 (4.72)	-.002 (.67)	.013 (3.44)	-.007 (4.33)	-.019 (1.97)	-.004 (.27)	.032 (5.73)
	Q	.007 (1.42)	.002 (.69)	.0002 (.04)	-.0009 (.52)	.019 (1.67)	.014 (.78)	-.004 (.59)
	QD	.006 (.56)	-.003 (.56)	.016 (1.80)	.003 (.90)	-.030 (1.27)	.046 (1.17)	-.016 (1.15)

Table 4-16 (con't)

Contract Provisions		Inst/Pupil	Adm/Pupil	Sal/Pupil	Benefits/P	T/S	Ave Sal	Other/Pupil
No Reduction During Contract (56)	B	.489 (51.11)	.033 (5.33)	.291 (34.55)	.130 (39.69)	.218 (12.48)	.436 (14.43)	.177 (14.52)
	D	-.021 (5.03)	-.002 (.91)	-.010 (3.00)	-.007 (4.59)	-.003 (2.74)	.001 (.09)	.029 (5.67)
	Q	-.005 (.46)	.005 (.88)	.002 (.20)	.024 (.65)	-.036 (1.55)	.040 (1.04)	.002 (.13)
	QD	.018 (.91)	-.004 (.37)	.006 (.36)	.010 (1.43)	.019 (.41)	.021 (.28)	-.005 (.18)
Dismissal for Just Cause: Tenured Only (61)	B	.489 (51.14)	.033 (5.26)	.291 (34.66)	.130 (39.67)	.218 (12.50)	.436 (14.41)	.177 (14.53)
	D	-.024 (4.67)	-.00001 (.003)	-.014 (3.26)	-.008 (4.58)	-.026 (2.25)	-.007 (.35)	.032 (4.96)
	Q	-.004 (1.03)	-.003 (1.15)	-.006 (1.83)	-.003 (1.77)	.009 (.99)	-.010 (.66)	.005 (.95)
	QD	.010 (1.21)	-.006 (1.29)	-.010 (1.45)	.005 (1.86)	.002 (.12)	.025 (.80)	-.007 (.63)
Dismissal for Just Cause: Non-tenured Only (59)	B	.489 (51.18)	.033 (5.26)	.291 (34.65)	.133 (39.66)	.218 (12.47)	.436 (14.44)	.177 (14.48)
	D	-.024 (4.74)	-.0003 (.11)	-.014 (3.12)	-.008 (4.42)	-.025 (2.10)	-.009 (.46)	.033 (5.03)
	Q	-.003 (.81)	-.003 (1.23)	-.006 (1.71)	-.002 (1.67)	.010 (1.04)	-.009 (.62)	.004 (.72)
	QD	.011 (1.38)	-.005 (1.04)	.009 (1.27)	.005 (1.65)	-.002 (.10)	.029 (.96)	-.009 (.82)

Table 4-16 (con't)

Contract Provisions		Inst/Pupil	Adm/Pupil	Sal/Pupil	Benefits/P	T/S	Ave Sal	Other/Pupil
Dismissal for Just Cause: Probationary Teachers Only (60)	B	.489 (51.08)	.033 (5.32)	.291 (34.55)	.130 (39.59)	.262 (12.48)	.436 (14.41)	.177 (14.53)
	D	-.021 (4.40)	.002 (.65)	-.012 (2.85)	-.007 (4.32)	-.029 (2.65)	-.0006 (.03)	.028 (4.61)
	Q	.00005 (.01)	.001 (.42)	-.003 (.68)	-.002 (1.48)	.005 (.46)	.003 (.15)	-.00001 (.002)
	QD	.004 (.43)	-.013 (2.66)	.005 (.67)	.004 (1.32)	.012 (.57)	.010 (.30)	.005 (.42)
Severance Pay (62)	B	.489 (50.19)	.026 (5.08)	.291 (33.91)	.130 (38.82)	.218 (12.30)	.436 (13.97)	.177 (14.67)
	D	-.021 (5.08)	-.003 (1.08)	-.012 (3.30)	-.007 (4.50)	-.027 (2.91)	.002 (.11)	.031 (5.85)
	Q	.015 (1.64)	.003 (.53)	.004 (.53)	.00005 (.02)	-.016 (.77)	.037 (1.09)	-.014 (1.23)
	QD	.020 (.93)	.065 (.53)	.033 (1.81)	.009 (1.24)	.058 (1.18)	.023 (.29)	-.022 (.82)
Class Size (40)	B	.489 (49.09)	.026 (4.61)	.291 (33.02)	.130 (37.43)	218 (12.33)	.436 (13.63)	.177 (13.80)
	D	-.033 (5.24)	-.0008 (.20)	-.019 (3.47)	-.008 (4.00)	-.041 (2.88)	-.005 (.23)	.036 (4.49)
	Q	-.004 (1.07)	.003 (1.36)	-.002 (.49)	.0005 (.39)	-.014 (1.56)	.0006 (.04)	-.0004 (.08)
	QD	.022 (2.66)	-.003 (.59)	.014 (2.01)	.004 (1.56)	.028 (1.48)	.013 (.44)	-.011 (1.01)

Table 4-16 (con't)

Contract Provisions		Inst/Pupil	Adm/Pupil	Sal/Pupil	Benefits/P	T/S	Ave Sal	Other/Pupil
Teacher Preparation Provision (53)	B	.489 (46.28)	.033 (4.78)	.291 (31.56)	.130 (35.33)	.218 (11.44)	.436 (13.20)	.177 (13.40)
	D	-.013 (1.60)	.0009 (.19)	-.010 (1.47)	-.002 (.64)	-.053 (2.92)	.020 (.68)	.014 (1.42)
	Q	-.002 (.43)	.0003 (.13)	-.004 (1.02)	.001 (.89)	-.008 (.74)	-.007 (.41)	-.005 (.93)
	QD	-.010 (1.09)	-.004 (.82)	-.005 (.07)	-.006 (1.84)	.037 (1.77)	-1.08 (.69)	.021 (1.79)
Education Policy Committee (44)	B	.489 (50.21)	.033 (5.35)	.291 (33.97)	.130 (38.79)	.218 (12.49)	.436 (14.23)	.172 (14.21)
	D	-.021 (3.91)	-.003 (.98)	-.009 (2.03)	-.007 (3.63)	-.031 (2.56)	.011 (.55)	.029 (4.43)
	Q	.0004 (.11)	-.002 (.65)	.006 (.19)	.0004 (.25)	-.012 (1.34)	.001 (.08)	.002 (.42)
	QD	.002 (.19)	.002 (.35)	-.003 (.40)	.001 (.48)	.014 (.75)	-.019 (.63)	-.0004 (.04)
Tuition Reimbursement (42)	B	.489 (50.39)	.033 (5.17)	.291 (33.98)	.130 (38.91)	.218 (12.16)	.436 (14.08)	.181 (14.86)
	D	-.019 (4.72)	-.002 (.96)	-.010 (2.87)	-.006 (4.06)	-.025 (2.67)	.003 (.19)	.029 (5.47)
	Q	.016 (1.98)	.003	.013 (1.77)	.007 (2.48)	.018 (.95)	.031 (1.01)	-.027 (2.60)
	QD	-.011 (.54)	-.004 (.24)	-.003 (.17)	-.006 (.81)	.003 (.06)	-.0004 (.01)	.020 (.02)

Table 4-16 (con't)

Contract Provisions		Inst/Pupil	Adm/Pupil	Sal/Pupil	Benefits/P	T/S	Ave Sal	Other/Pupil
Inservice Provision (70)	B	.489 (49.38)	.026 (38.36)	.291 (33.45)	.130 (4.99)	.218 (11.84)	.436 (13.80)	.181 (14.55)
	D	-.012 (2.37)	-.001 (2.78)	-.008 (1.69)	-.002 (.10)	-.021 (1.73)	.010 (.52)	.021 (3.21)
	Q	.005 (1.14)	-.0001 (.42)	-.0001 (.04)	.006 (.52)	.007 (.83)	.008 (.53)	-.007 (1.47)
	QD	-.020 (2.39)	-.0006 (1.00)	-.007 (1.03)	-.026 (1.07)	-.011 (.61)	-.018 (.59)	-.021 (2.05)
Summer Sabbatical (6)	B	.489 (50.27)	.033 (5.30)	.291 (33.85)	.130 (39.01)	.218 (12.29)	.436 (13.98)	.172 (14.20)
	D	-.026 (5.69)	-.003 (1.09)	-.014 (3.63)	-.008 (5.02)	-.028 (2.64)	.004 (.23)	.036 (6.16)
	Q	-.001 (.24)	-.002 (.62)	-.0007 (.15)	-.003 (1.36)	-.008 (.63)	.016 (.82)	.012 (1.84)
	QD	.024 (2.50)	.003 (.55)	.016 (1.89)	.009 (2.54)	.014 (.61)	-.012 (.34)	-.030 (2.43)
Number of Aides Specified (19)	B	.489 (51.01)	.033 (5.35)	.291 (34.60)	.130 (40.02)	.218 (12.40)	.436 (14.44)	
	D	-.020 (4.76)	-.002 (.88)	-.009 (2.65)	-.005 (3.82)	-.027 (2.83)	.006 (.40)	
	Q	.015 (1.04)	.00007 (.01)	.021 (1.72)	.006 (1.15)	-.015 (.46)	.045 (.88)	
	QD	-.024 (.90)	-.004 (.66)	-.047 (2.05)	-.031 (3.27)	.049 (.79)	-.144 (1.44)	

Table 4-16 (con't)

Notes:

1. B is the proportion of an additional dollar of expenditure that is allocated to each budget category.

2. D is the difference in the allocation of an additional dollar of expenditure between districts with increasing and decreasing enrollments when neither district has the contract item.

3. Q is the difference in the allocation of an additional dollar of expenditure in declining enrollment districts accounted for by the presence of the contract provision in districts' collective bargaining contract.

4. QD+Q is the same as Q but for increasing enrollment districts.

5. This number is the proportion of an additional dollar of expenditure allocated to a particular budget category.

6. The number in parentheses is the T statistic.

to the same extent as they affect districts experiencing declining enrollments. The results in Table 4-17 show that the estimates relating to the effect of contract items on the respective types of districts have the same sign and usually close to the same level of statistical significance. We do, however, find that the estimates are slightly larger for increasing enrollment districts than for declining districts. For example, the presence of the staff reduction procedure directs an additional $0.08 for an additional $10 dollar increase in per pupil expenditures in declining enrollment districts compared to a $0.13 increase in increasing enrollment districts. Other comparisons are obvious from the Table.

Despite the strong similarities between the two types of districts, there is one difference that should be noted. We find that for districts facing increasing enrollments the seniority clause raises the average salary of teachers in these districts while the average salary of teachers in declining enrollment districts remain unaffected. On the other hand, the seniority clause raises the teacher student ratio in declining districts while leaving the teacher student ratio in increasing enrollment districts unchanged.

The explanation of these results may be found in the recognization that the reduction in staff is also affected by the class size limitation provision. Districts which have established a particular student teacher ratio to follow, can use it in both the situation of declining enrollments as well as increasing enrollments. It may be the case that teachers originally sponsored this provision in order to reduce the teaching load during the early 70's when enrollments were increasing. However, as enrollment decreases, what was once an upper limit on the class size now becomes an upper limit on the number of teachers per student that the

Table 4-17

Impact of Labor Jurisprudence Contract Items and Class Size Provision
In Increasing and Declining Enrollment Districts

	Inst/Pupil		Adm/Pupil		Benefits/Pupil		Salaries/Pupil		T/S		Average Salary	
	-	+	-	+	-	+	-	+	-	+	-	+
55	.008 (2.03)	.013 (1.68)	.001 (.55)	-.008 (1.70)	.002 (1.19)	.003 (1.11)	.006 (1.74)	.009 (1.30)	.005 (.56)	-.001 (.08)	.034 (2.29)	.030 (1.02)
58	.006 (1.03)	.025 (2.19)	.003 (.71)	-.004 (.58)	.0002 (.10)	.005 (1.32)	.003 (.53)	.016 (1.61)	.002 (.17)	-.011 (.43)	.032 (1.40)	.067 (1.57)
57	.007 (1.42)	.013 (1.39)	.002 (.69)	-.002 (.26)	-.001 (.52)	.002 (.74)	.0002 (.04)	.016 (2.26)	.020 (1.67)	-.012 (.54)	.014 (.78)	.060 (1.74)
56	-.005 (.46)	.013 (1.44)	.005 (.88)	.001 (.10)	.024 (.65)	.012 (2.06)	.002 (.20)	.008 (.54)	-.036 (1.55)	-.018 (.46)	.040 (1.04)	.061 (.96)
61	-.004 (1.03)	.006 (.80)	-.003 (1.15)	-.010 (2.13)	-.003 (1.77)	.003 (1.12)	-.006 (1.85)	.004 (.62)	.009 (.99)	.012 (.70)	-.010 (.66)	.015 (.55)
59	-.003 (.81)	.009 (1.12)	-.003 (1.23)	-.010 (1.89)	-.002 (1.67)	.002 (.94)	-.006 (1.71)	.003 (.48)	.010 (1.04)	.008 (.48)	-.009 (.62)	.020 (.75)
60	.000 (.01)	.004 (.51)	.001 (.42)	-.013 (2.82)	-.002 (1.48)	.002 (.63)	-.003 (.68)	.002 (.36)	.005 (.46)	.017 (.96)	.003 (.15)	.013 (.44)
62	.015 (1.64)	.035 (1.79)	.003 (.53)	.010 (.81)	.000 (.02)	.009 (1.37)	.004 (.53)	.037 (2.23)	-.016 (.77)	.042 (.94)	.037 (1.09)	.060 (.83)
40	-.004 (1.07)	.017 (2.42)	.003 (1.36)	.0003 (.08)	.0005 (.39)	.005 (1.98)	-.002 (.49)	.012 (2.00)	-.014 (1.56)	.013 (.81)	.0006 (.04)	.014 (.52)
									(Elasticity)		(Elasticity)	

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administration will hire. Districts that strictly adhere to a specific teacher student formula will base the reduction in the teaching staff on the decrease in enrollments. The results show that districts facing declining enrollments have cut their staffs to a greater extent when a class size limitation provision is present than when it is absent. Consequently, when the class size provision is present in the contract, the administration will use this rationale to reduce staff.

The administration may be restricted by other criteria of staff reduction as contained in additional contract provisions. For example, if layoffs are governed by a seniority clause then the freedom of the administration to base staff reduction solely on the class size provision is diminished. We find that districts, even though experiencing declining enrollments, have a larger student ratio when the seniority clause is present than otherwise.

The Effect of Collective Bargaining on the Mobility of Teachers

We have considered how school administrators allocate educational resources subject to their own information and the information provided by collective bargaining contracts. In the previous analysis, we assumed that administrators unilaterally make decisions about the size and composition of the teaching staff. This is not necessarily the case. Although administrators choose the number of teachers to employ and have a set of attributes in mind when hiring teachers, the decisions of teachers to seek employment and to leave employment are also important in determing the overall characteristics of the teacher staff. The propensity of certain teachers to quit and apply for employment will affect the composition of the teaching staff which, in turn, may affect not only the quality but also the cost of education. The quality of education is affected by a change in the attributes of the teaching staff which, as will be discussed later, can be shown to affect student achievement. The cost of education is affected by the high turnover rate accompanying quits and the concomitant change in payroll costs brought about by changes in the education and experience levels of teachers.

Following the work of Freeman and Medoff, we examine whether collective bargaining influences quit rates.[13] Unlike earlier work in this area, however, we are able to consider the impact of individual contract items on quits rather than the differential behavior of union versus nonunion districts. Although the hiring of new teachers will be discussed, the major focus of this analysis is on quit behavior. This follows for two reasons. First, teachers have more discretion in quitting than being hired since the administration decides who to hire. Second, collective

bargaining is more likely to influence the decision to quit rather than the decision to seek employment with a particular school district.

Employment is a two-sided arrangement dependent upon the decisions of school administrators and teachers. Job tenure (or quits) results from the joint behavior of administrators who decide whether or not to retain a teacher and employees who choose to stay or go. The basic principle for maintaining the employment relation is that neither side can expect to do better in the outside market. Administrators cannot hire any more qualified teachers at the same salary, and teachers cannot find any better working conditions at the same salary. Thus, teachers will remain at their present positions if the discrepancies between desired and actual employment arrangements are not sufficiently large to warrant a search for alternative employment.

Seeking alternative employment is not the only option open to teachers who are dissatisfied with their present situation. Instead of leaving a school district because of suboptimal working conditions and salary, teachers may choose to voice complaints about their employment situation in hopes that the administration will take action to change the undesirable features of the job.

Teacher unions provide teachers a forum to express their opinions about their level of compensation and working conditions and a vehicle to bring about change through the strength of collective action. Thus, teacher unions offer a viable option to the free market alternative of quitting in response to undesirable employment arrangements.

Teacher unions can reduce teacher turnover in a number of ways. First, teacher unions offer a formal mechanism for resolving employee relation problems that otherwise would result in the departure of teachers.

One of the most important outcomes of collective bargaining is the creation of formal channels for handling and arbitrating teacher grievances. The grievance and arbitration system gives teachers a mechanism to resolve conflicts between them and the administration. Although the system will not reduce all grievance related quits, the overall exit rate will be reduced as a result of the delay in the quit decision during the grievance and arbitration procedure.

Second, the negotiation process itself can be expected to reduce quits. Teachers who seek different working conditions might lobby for the changes within their own district through contract negotiations rather than search for districts which already possess the desired conditions. However, since working conditions are a public good and the changes presented at the bargaining table represent the preferences of the group, the preferences of the individuals may not be represented and the teacher may choose to leave the district. Workers whose demands are met will decide to remain with the district. Thus, quits will be lower than they would have been if the voice mechanism were not available.

Third, unions provide teachers with a voice in establishing procedures for reducing the teaching staff due to declining enrollment. Traditionally, teacher employment has been governed by the tenure system. Recently, however, the overall decline in enrollments has resulted in non-tenured and tenured teachers being laid off. Negotiated procedures for reducing the teaching staff helps alleviate the anxiety and loss of morale accompanying layoffs, and thereby reduce voluntary resignations. Time consuming layoff procedures may also increase the costs of laying off teachers and increase the incentive for districts to find other revenues or other ways to cut costs besides layoffs. In both cases, quits may be reduced by the establishment of reduction in force provisions.

Besides reducing quits because of the voice option, teacher unions can be expected to reduce exit behavior through their influence on wages and fringe benefits. Unions can raise salaries and employee benefits through the monopoly position they maintain in offering teachers services. Chambers (1977) estimates that unions are able to increase salaries by as much as 16 percent over salaries received by nonunion teachers. Teachers who consider salaries to be a primary attraction to a district will have more incentive to remain with union districts than nonunion districts.

The impact of teacher collective bargaining in reducing the number of quits can be measured by considering the differences between quit rates in districts with reduction in force procedures based on seniority and the quit rates in districts without such provisions. We examine the behavior of individual teachers and not the aggregate behavior of all teachers in a district. In this context, the decision to depart is analyzed within a probability framework in which the departure of a teacher is a dichotomous variable (P). The variable P takes on the value 1 if a teacher is observed to quit within a particular time period or the value 0 if the teachers does not quit. The probability that an individual quits can be explained by a set of factors including the contract items. However, since the dependent variable is dichotomous, the logistic functional form will be fitted to the data instead of the simple linear form. Thus,

$$P = \frac{1}{1 + e^{-bx}} \tag{21}$$

where the X's are the explanatory variables and the b's are the coefficients. After some manipulation, this departure equation (21) can be written:

$$\log\left(\frac{P}{1-P}\right) = b_0 + b_1 x_1 + \ldots + b_N x_N + \varepsilon \tag{22}$$

This formulation considers the impact of various factors on the odds that an individual will leave the districts. The coefficients of the explanatory variables measure the partial effects of each factor on the odds of quitting. This method of analysis is different from a simple frequency analysis because it allows us to consider the impact of certain factors while holding constant other important factors. Because of this the two methods may yield slightly different results.

Four groups of factors are considered in the departure equation: characteristics of the teacher, characteristics of the student body and district, the difference in salary received by a teacher and what could be received elsewhere, and characteristics of the collective bargaining agreements. The characteristics of teachers affect the probability of quitting through the mobility of the teacher. Age and personal qualifications are important factors in mobility. Studies have shown that individuals have the greatest mobility when they are younger than 35 years. After this age, families become less mobile because of children in school and personal ties to the community. Personal qualifications are important in the ability to find employment elsewhere. More qualified teachers in terms of education and experience have a greater chance of finding employment elsewhere than others. The education level also may indicate the level of motivation of the teacher. It should be mentioned that teachers may become over-qualified which may work against their ability to find employment in another school district. Sex may also play an important role in explaining quit behavior. Due to child bearing and rearing, female teachers are more likely to leave and enter the labor force more often than male teachers. This is especially true for female teachers in the child bearing years.

The characteristics of the school district can have a push effect on the decision of teachers to quit. Districts with students who are less motivated and who have discipline problems may induce teachers to quit more frequently. On the other hand, districts with a high level of parent support as measured by the percentage of parents who have attended college may encourage teachers to remain within the district.

Teachers in districts facing declining enrollments may find working conditions deteriorating, job security diminishing, and opportunities for advancement disappearing. Thus, even though these teachers may not be laid off, they may choose to find more promising employment

The difference in the salary actually received and one which could be received elsewhere is measured by the difference between the actual salary and predicted salary of the individual teacher. The predicted salary is based on the attributes of the teacher and the imputed value of the employee benefits received by the teacher. The difference between the actual and the predicted provides a comparison of the salary of a particular teacher with the average salary of teachers in New York with the same attributes. We would expect that if the salary package is an important determinant of departures, then teachers will more likely depart when their salaries are below the average than above.

Past studies have considered the presence of a union to imply that reduction in force procedures are present. This is not necessarily the case. In fact, less than half of the districts in New York who have contracts include a reduction in force procedure and only 18 percent of the districts base reduction in force on seniority. Therefore, it is necessary to divide the districts, not by the fact that they are represented by a union, but rather by the fact they actually have a reduction in force

procedure. In this analysis, we will concentrate primarily on reduction in force procedures that are based on seniority.

We would expect that more senior teachers in districts with a seniority clause will be less likely to leave than more senior teachers in districts without the provision. At the same time, we would expect that less senior teachers covered by the seniority clause will be more likely to leave since they would be the first to be laid off in times of declining enrollments. We measure the level of seniority in relation to the median level of experience in the district. The median teacher is a convenient reference for two reasons. First, it indicates the experience distribution of teachers and the relative ordering of experience levels in a district.

For example, a teacher with seven years experience may be a senior person in a district with a median level of five years while that same teacher may be a junior person in a district with a median level of 10 years experience. Second, since the decisions of collective bargaining units are primarily made by majority vote, the preferences of the median voter are served by the bargaining units. Therefore, teachers whose experience levels lie to either extreme from the experience of the median voter are less likely to have their preferences satisfied by the decisions of the bargaining unit.

The Analysis of Teacher Quits

A random sample of 15,000 teachers from one fifth of the public school districts in New York is used to examine quit behavior. The data are obtained from the personnel records of each school district. Although the records do not contain specific information on whether the teacher has left

the district, we are able to compare the personnel records of two consecutive years, 1976-77 and 1977-78, to identify teachers who no longer are employed with the district. Teachers have a number of options when leaving a district. They can obtain employment in another public school district, leave public school teaching for another occupation, or retire. It is possible to trace the whereabouts of the teacher if that teacher remains within the employment of public school districts in New York. However, since this process would involve searching through over 138,000 records, we felt that little would be gained by the additional information.

The sample of teachers is fairly consistent with the entire population of public school teachers in New York, although some minor differences do exist. Teachers in the sample earn on average $16,451 compared with the state average of $15,147. This may be attributed to the fact that the teachers in the sample come from larger districts than the state average. The percentage of teachers with masters degrees and the total years experience of the average teacher are roughly the same for both groups. Community and student characteristics are also comparable. A few contract items are found more frequently in the sample than the state population, primarily due to the fact that larger districts are considered in the sample. However, the differences are not significant.

The analysis shows that in 1977-78 2,225 teachers or slightly under 18 percent of the teachers sampled are no longer employed in the same district they were the year before. Tables 4-18a-c show the various characteristics of the teachers who left the districts. Table 4-18a shows that of those who quit over 54 percent have masters degrees or higher. Table 4-18b shows departures by age. Teachers who are less than 28 years old have the highest propensity to quit among the five age groups considered

with 22 percent of the teachers in this group leaving. The percentage of quits decrease as the teacher becomes older. The trend continues until teachers in certain age brackets reach retirement age at which time the percentage increases again.

We find that female teachers are more likely to quit than male teachers. The figures in Table 4-18c show that 19.33 percent of the female teachers quit during the two year period while only 15.61 percent of the males left the district. Of those teachers who left, we find that 61.94 percent are female and 38.06 percent are male. If there were no difference in behavior between male and female teachers, we would expect the percentages to reflect the percentage of each sex in the sample, 43.21 percent and 56.79 percent respectively. Therefore, roughly 5 percent more female teachers quit than we would expect if the behavior were identical.

Table 4-18a

Departures By Masters Degrees or Greater

	No Masters	Masters or Greater	Total
Remain:	4,638 36.75% 44.63% 81.96%	5,754 45.61% 55.37% 82.70%	10,392 82.37%
Depart:	1,021 8.09% 45.89% 18.04%	1,204 9.54% 54.11% 17.30%	2,225 17.63%
Frequency	5,659	6.958	12,617
Percentage	44.85%	55.15%	

Row percentage

Column percentage

Table 4-18b

Departures by Age

	-28	28-38	38-50	50-60	60-	Total
Remain:	2,177	3,848	2,873	1,323	171	10,392
	17.25%	30.50%	22.77%	10.49%	1.36%	82.36%
	20.95%	37.03%	27.65%	12.73%	1.65%	
	77.03%	84.39%	86.04%	81.07%	65.52%	
Depart:	649	712	466	309	90	2,226
	5.14%	5.64%	3.69%	2.45%	0.71%	17.64%
	29.16%	31.99%	20.93%	13.88%	4.04%	
	22.97%	15.61%	13.96%	18.93%	34.48%	
Frequency	2,826	4,560	3,339	1,632	261	12,618
Percentage	22.40%	36.14%	26.46%	12.93%	2.07%	100.00%
Row Percentage						
Column Percentage						

Table 4-18c

Departures by Sex

	Male	Female	Total
Remain:	4,514	5,670	10,184
	36.47%	45.81%	
	44.32%	55.68%	82.28%
	84.39%	80.67%	
Depart:	835	1,359	2,194
	6.75%	10.98%	
	38.06%	61.94%	17.72%
	15.61%	19.33%	
Frequency	5,349	7,029	12,378
Percentage			
Row percentage	43.21%	56.79%	100.00%
Column percentage			

Table 4-18d shows the difference in the number of departures by teachers between declining enrollment districts and increasing enrollment districts. Districts experiencing a decrease in enrollments between 1972 and 1978 had 18.61 percent of their teachers depart while districts facing increasing enrollments have 2 percent fewer teachers depart. Consequently, for a district with 300 teachers, approximately 6 more teachers left the district if it was experiencing a decrease in enrollment than it if was experiencing an increase.

The results from Tables 4-18a-d provide an overall picture of teachers who depart. Over half of the teachers who quit have masters degrees or higher, are relatively young, are more likely to be female than male, and depart from declining enrollment districts slightly more often than from increasing enrollment districts. The consequences of these teachers leaving the districts can be observed in relation to the teachers who remain. Thus, districts on average should have a slightly less educated teaching staff as a result of departures.

The net results of teacher mobility on the composition of the teaching staff is further revealed by examining the characteristics of new entrants into the district. Data on new entrants is contained in Tables 4-20a-d. Our results show that 63 percent of the teachers who were new to the district in 1977-78 have masters degrees or higher. The increase in educational attainment is primarily from recent graduates who are entering the teaching profession for the first time. It appears that a higher proportion of new graduates are entering the declining enrollment districts to replace, at least partially, the greater number of teachers departing these districts. This is evidenced by the fact that declining enrollment districts have approximately five percent more of their teaching staff with masters degrees than increasing enrollment districts.

Table 4-18d

Departures By Change In Enrollment

	Declining	Increasing	Total
Remain:	5,205	5,187	10,392
	41.25%	41.11%	82.36%
	50.09%	49.91%	
	81.39%	83.35%	
Depart:	1,190	1,036	2,226
	9.43%	8.21%	17.64%
	53.46%	46.54%	17.65%
	18.61%	16.25%	
Frequency	6,395	6,223	12,618
Percentage			
Row Percentage	50.68%	49.32%	100.00%
Column Percentage			

Table 4-19

Education By Age

	<28	29-38	38-50	50-60	60<	
B.A.	1,380	818	551	230	61	3,040
	11.04%	6.55%	4.41%	1.84%	.49%	24.33
	45.39%	26.91%	18.13%	7.57%	2.01%	
	49.10%	18.12%	16.61%	14.29%	25.10%	
B.A.+	408	978	680	371	61	2,498
	3.27%	7.83%	5.44%	2.97%	.49%	19.99%
	16.33%	39.15%	27.22%	14.85%	2.44%	
	14.51%	21.66%	20.49%	23.06%	25.10%	
M.A.	970	2,127	1,191	525	50	4,863
	7.76%	17.02%	9.53%	4.20%	.40%	38.92%
	19.95%	43.74%	24.49%	10.80%	1.03%	
	34.50%	47.11%	35.90%	32.63%	20.58%	
M.A.+	53	592	896	483	71	2,095
	.42%	4.74%	7.17%	3.87%	.57%	16.77%
	2.53%	28.26%	42.77%	23.05%	3.39%	
	1.89%	13.11%	27.00%	30.02%	29.22%	
Frequency	2,811	4,515	3,318	1,609	243	12,496
Percentage						
Row Percentage	22.50%	36.13%	26.55%	12.88%	19.45%	
Column Percentage						

Table 4-20a

Teacher Entries in 1977-78 by Education

	B.A.	Masters+	
Teachers in 1976-77	5,538	6,958	12,496
	36.05%	45.29%	81.34%
	44.32%	55.68%	
	84.13%	79.26%	
New Entries in 1977-78	1,045	1,821	2,866
	6.80%	11.85%	18.66%
	36.46%	63.54%	
	15.87%	20.74%	
Frequency	6,583	8,779	15,362
Percentage			
Row Percentage	42.85%	57.15%	100.00%
Column Percentage			

Table 4-20b

Entries by Sex, Sample of Teachers in New York School Districts, 1977-78

	Male	Female	
Teachers in 1977-78 who are not new entries	4,514	5,670	10,184
	36.78%	46.20%	82.97%
	44.32%	55.68%	
	83.86%	82.28%	
New Entries in 1977-78	869	1,221	2,090
	7.08%	9.95%	17.03%
	41.58%	58.42%	
	16.14%	17.72%	
Frequency	5,383	6,891	12,274
Percentage	43.86%	56.14%	100.00%
Row Percentage			
Column Percentage			

Table 4-20c

Teacher Entries in 1977-78 by Age

	<28	28-38	38-50	50-60	60<	
Teachers in 1976-77	2,826	4,560	3,339	1,632	261	12,618
	16.78%	27.07%	19.82%	9.69%	1.55%	74.90%
	22.40%	36.14%	26.46%	12.93%	2.07%	
	59.71%	84.10%	78.05%	78.46%	78.38%	
New Entries in 1977-78	1,907	862	939	448	72	4,228
	11.32%	5.12%	5.57%	2.66%	0.43%	25.10%
	45.10%	20.39%	22.21%	10.60%	1.70%	
	40.29%	15.90%	21.95%	21.54%	21.62%	
Frequency	4,733	5,422	4,278	2,080	333	
Percentage	28.10%	32.19%	25.39%	12.35%	1.98%	
Row Percentage						
Column Percentage						

Table 4-20d

Entries by Change in Enrollment, Sample of Teachers in New York School Districts, 1976-77, 1977-78

	Declining	Increasing	
Teachers in 1977-78 Who are not new entries	5,205	5,187	10,392
	38.52%	38.39%	76.91%
	50.09%	49.91%	
	67.18%	89.99%	
New Entries in 1977-78	2,543	577	3,120
	18.82%	4.27%	23.09%
	81.51%	18.49%	
	32.82%	10.01	
Frequency	7,748	5,764	13,512
Percentage	57.34%	42.66%	100.00%
Row Percentage			
Column Percentage			

The age distribution of teachers also changes as a result of departures and entries of teachers. Of those teachers who depart, 61 percent are less than 38 years old. Fifty-eight percent of the teachers who remain are less than 38. Teachers who enter the district are much younger with close to 66 percent less than 38 years old of whom 45 percent are less than 28 compared with 29 percent of those who leave. With the influx of young graduates into the system, the average age of teachers falls in districts which hire teachers. Again, since more teachers leave declining enrollment districts to be replaced partially by younger teachers we find the age distribution more affected in these districts than increasing enrollment districts.

The results of a logit analysis are displayed in Table 4-21. As mentioned earlier, the coefficients are interpreted as the partial effects of the corresponding factor on the odds that a teacher will quit. We find that teachers who receive salaries above the average salary are less likely to quit than teachers who fall below the norm. The estimate of the coefficient is statistically significant at the .01 confidence level. Only one of the teacher characteristics coefficient is statistically significant. The positive sign on the sex coefficient indicates that female teachers are more likely to quit than male teachers.

District characteristics affect the decision to quit in the directions we anticipated. Teachers in districts with higher than average dropout rates have a higher propensity to quit than teachers in other districts. On the other hand, teachers from districts with a higher percentage of parents who have attended college are less likely to quit than otherwise. Both these coefficients are statistically significant at reasonable levels of confidence which indicates that the working conditions of the district are important in the teachers' decisions to quit.

Table 4-21

Logit Analysis of the Quit Behavior of Teachers in New York School Districts, 1976-77, 1977-78

Explanatory Variables	Estimates (t-statistics)
Intercept	-2.30 (12.61)
Difference Between Actual & Predicted Salary	-.000032 (2.16)
Masters Degree (MA = 1)	+.0070 (.11)
Age	+.0011 (.31)
Dropout Rate	+.091 (2.25)
% of Students From Families on Welfare	-.026 (1.29)
% of Parents with College Education	-.350 (1.55)
Sex (Female = 1)	+.320 (4.96)
Seniority Clause (Yes=1; No=0)	+.019 (.15)
(Seniority) * DM*	-.039 (2.14)
(Seniority) * D**	-.320 (1.95)
(Seniority) * D* DM	-.012 (.40)
D	+.592 (8.07)
D * DM..	-.009 (1.11)
-Log Likelihood	3581.7
Percentage of Quits	13.3%

Dependent variable is the log of the odds of quitting.

*DM = Experience of individual teacher minus median experience in district.

**If D = 1 district faced increasing enrollment between 1972 and 1976.
If D = 0 district faced declining enrollment between 1972 and 1976.

The impact of the seniority clause on quits is entered into the equation in relation to the change in enrollments and the experience level of teachers. The change in enrollment is entered since teachers in districts facing declining enrollments are more likely to be influenced by the seniority clause when deciding to quit than teachers in increasing enrollment districts. The contract item and the change in enrollment variable are entered into the equation as interactive terms in the same manner used earlier in the chapter. The coefficients are interpreted as before. The coefficient on the contract variable indicates the impact of the contract item on teachers in districts facing declining enrollments. The summation of the coefficients on the contract variable and the interaction variable measures the impact of the contract item on teachers in increasing enrollment districts.

In addition to the effect of enrollment changes on the impact of contract items on the quit behavior, the experience of the teacher is also expected to be a factor. The presence of the seniority clause is expected to induce less senior teachers to have a higher probability of quitting than more senior teachers. This behavior can be incorporated into the departure equation by writing the coefficient of the contract item, interaction term, and declining enrollment variable, as a function of the difference between the experience level of the individual teacher and the median experience level in the district (DM). The following equation shows this relationship:

$$(23) \quad b_i = d_{oi} + d_{1i}\,(DM) \qquad i = 1,2,3$$

where b_1, b_2, b_3 are the coefficients of the contract item variable, interaction variable, and enrollment variable, respectively, without taking into

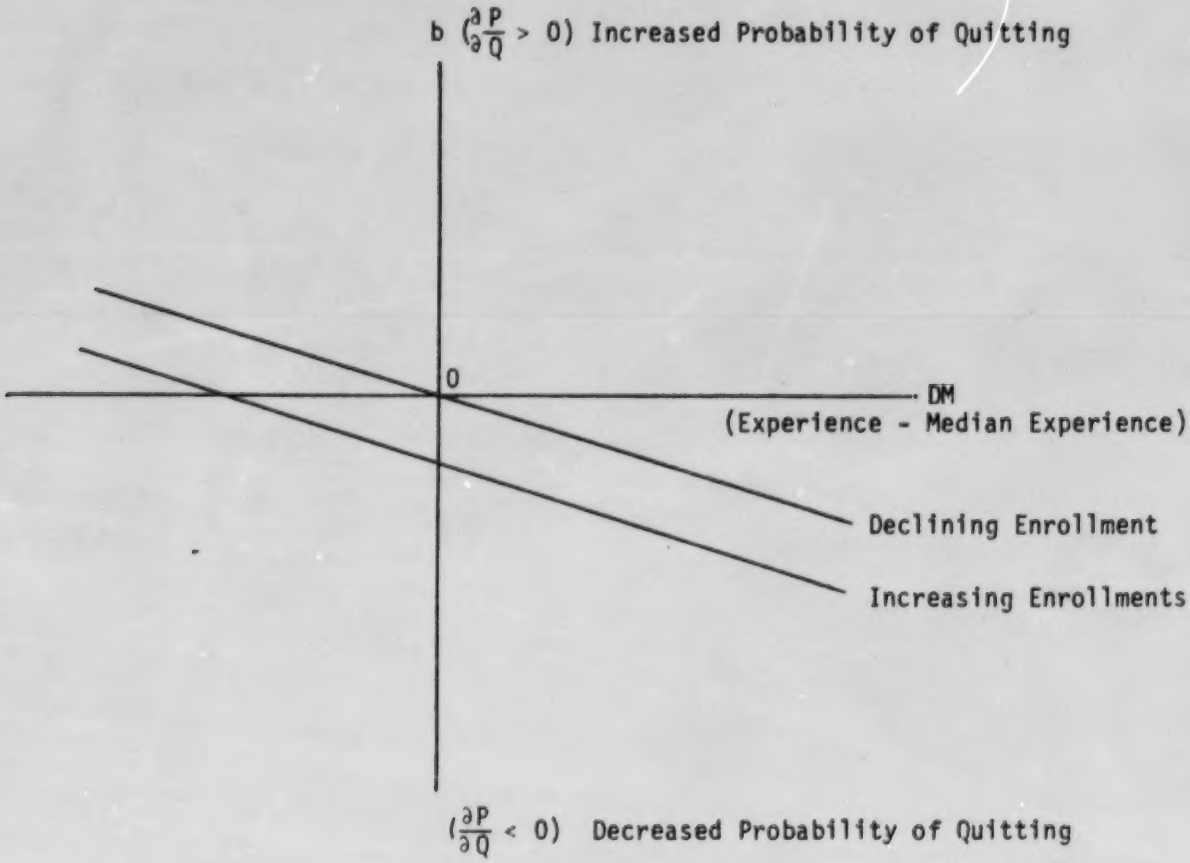
consideration the experience of the teacher. The d_{1i} coefficients take into account the relative experience of the teacher.

For example, a negative estimate of the d_{1i} coefficient would indicate that an increase in the seniority of the teacher relative to the median experience level reduces the impact of the contract item on the probability of the teacher quitting. In the same way, a reduction in seniority in which DM turns negative, increases the impact of the contract item.

The relation between the level of experience and the impact of the seniority clause on quits is illustrated in Figure 4-2. The vertical axis represents the impact of the seniority clause on quits. This is denoted by b_1 in equation (23). The horizontal axis is the difference between the experience of an individual teacher and the median level of experience in the district. The origin represents a teacher with the median years experience. Points to the left of the origin are occupied by junior teachers, relative to the median, and points to the right by more senior staff.

Figure 4-2

Relationship Between the Experience of the Teacher and Impact of the Seniority Clause on the Propensity to Quit


b $(\frac{\partial P}{\partial Q} > 0)$ Increased Probability of Quitting
0
DM
(Experience - Median Experience)
Declining Enrollment
Increasing Enrollments
$(\frac{\partial P}{\partial Q} < 0)$ Decreased Probability of Quitting

A negative estimate of the d_{1i} reveals that more senior teachers are less likely to quit than more junior staff when covered by the seniority clause. In terms of the diagram, more experienced teachers will have a lower value of b_i which indicates a less significant positive impact on the willingness of the teacher to leave the district. Conversely, it indicates a smaller propensity to quit. A decrease in the intercept term (d_{0i}) simply expands the range of experience levels in which the seniority clause reduces the probability that a teacher will quit.

The impact of the seniority clause on teacher quits differs slightly between declining enrollment districts and increasing enrollment districts. For the increasing enrollment districts, the estimate of the contract item (d_{0i}) is positive and significant. This suggests that teachers who are less experienced than the median teacher will be more inclined to quit than teachers to the right of the median teacher when covered by a seniority clause. Since the switching point between a positive and negative effect is to the left of the median teacher, a greater range of teachers are induced to stay with the district when the district is facing increasing enrollment as opposed to declining enrollment.

To summarize, we are interested in the impact of collective bargaining on the quit behavior of teachers because departures affect the quality and cost of education. We find that the reduction in force based on seniority significantly influences the decision to quit. The seniority clause reduces the propensity of more senior teachers to quit while increasing the propensity to quit of less experienced teachers. We also find that teachers who quit are younger, less experienced, slightly more educated, and more likely to be female than teachers who remain. On the other hand, the teachers hired to replace those who quit, although younger, are more highly educated

than those who quit. Thus, districts with larger turnovers may be paying higher salaries but at the same time may be building a higher quality staff which could result in higher test scores. The link between teacher characteristics and student achievement will be explored in the next section.

The Impact of Collective Bargaining on Student Achievement

The analysis has shown that collective bargaining influences the allocation of educational resources and the composition of the teaching staff. These are important findings in themselves since many of the previous studies of teacher collective bargaining have failed to find much significant correlation. The educational process does not end with the allocation of resources and the hiring of teachers. These decisions are made in order to provide quality education to the students. In this section we explore the impact of teacher collective bargaining on the achievement level of students.

Collective bargaining can influence the quality of education in a number of ways. First, collective bargaining can affect the quantity and mix of various educational inputs which are important in delivering educational services. For example, because of collective bargaining demands, districts may be forced to allocate funds to teacher salaries that otherwise would have been spent on materials and supplies, thus perhaps depriving students of updated textbooks and curriculum. On the other hand, districts which do not provide adequate salaries and working conditions for teachers may find that the most capable teachers leave the district to seek more favorable employment elsewhere. Consequently, the allocation of inputs essential to the provision of educational services will have a significant impact on student achievement.

Second, collective bargaining can affect the attitudes of teachers toward their work. Teachers are not inert inputs into the educational process, but react to policies and the working environment established in the school district. Collective bargaining in many cases provides a voice through which teachers can assume an active role in setting educational

policy, planning curriculum, and providing a working environment which is more in line with their preferences than would otherwise be the case. Moreover, teachers are trained educators, and their input into the establishment of educational policy may provide insights that administrators have overlooked. Thus, collective bargaining can provide the mechanism to elicit greater cooperation among administrators and teachers which enhances the effectiveness of teachers.

The impact of collective bargaining on the quality of education is examined within the framework of the teacher effectiveness model developed in Chapter 3. It is derived from an assumption that decision makers choose the level of inputs which will maximize the student test scores in the district.

A number of quantitative studies relating school resources and student achievement have appeared in the last decade and a half. Until relatively recently, most of them have failed to show that school resources affect school outcomes. A few recent studies, using improved methodology and measurement techniques, show that schools do make a difference. Most notably, Brown and Saks (1975) and Summers and Wolfe (1976) have reversed the trend of insignificant estimates of input effectiveness. The renewed faith in the educational production framework allows us to take the essential step from resources to outcomes.

Since collective bargaining negotiations are conducted at the district level, we use the aggregated district level production function formulated by Brown and Saks. Their approach assumes that the complex decision-making process of school districts can be summarized by the well-behaved welfare function of student test scores. Resource decisions are based on the maximization of a school district welfare function subject to

production and input constraints. Within this framework, they show that the attributes of teachers and students and the teacher student ratio can explain the level and distribution of student outcomes. We take this model a step further to investigate the effect of union contract characteristics on the productivity of certain teacher attributes and the delivery of educational services. We also expand on the model by including an analysis of the effect of class arrangement on student outcomes.

The analysis in this section is organized into three parts. The first part briefly reviews the educational production model and describes the estimation of the model. The next part considers the impact of contract items on the effectiveness of certain teacher attributes. The third part will consider the influence of contract items on the behavioral responses of teachers which are related to teacher effectiveness.

Educational Production Process

One of the first problems in formulating the teacher effectiveness model is to define the outcomes. Most researchers and practitioners consider the educational product to consist of both cognitive and noncognitive outcomes. Cognitive outcomes include subject-specific as well as general improvements in abilities and knowledge. These outcomes are typically measured by standardized achievement test scores. Noncognitive outcomes include changes in attitudes, interests, preferences and values, degree of socialization, and the provision of custodial services. Noncognitive outcomes are very difficult to measure especially when intended for use in a production function framework. Consequently, most studies have used cognitive measures. These measures are by no means problem free, but as Murnane points out in a recent survey of educational production

functions, "they do provide the best available measures of student achievement that can be used in large scale studies."(14)

Brown and Saks have suggested a refinement on the measurement of cognitive skills. Instead of considering only the mean achievement scores of students in a district, they consider the entire distribution of scores by using both the mean and the standard deviation of test scores. This allows us to detect whether students in the tails of the distribution are affected by certain inputs. It is conceivable that inputs may affect high achievers or low achievers without significantly affecting the average scores in the district.

Since the primary instrument of the educational process is the interaction between students and teachers, we need to consider the characteristics of each of these groups and the method of interaction when modeling the process. Murnane points out that virtually every study of school effectiveness finds that some attributes of teachers are significantly related to student achievement. Administrators, when hiring teachers, traditionally look for characteristics such as educational attainment, experience, age, and perhaps even race in order to match teachers to the composition of the students. In this study we concentrate on the attributes of experience and education to explain student achievement. Experience embodies a type of on-the-job training which enhances the teacher's effectiveness while education represents an updating of skills and techniques if not simply a sign of motivation on the part of the teacher.

The characteristics of students are important to consider because students are not simply empty slates, but they bring to the classroom different abilities, motivation, and encouragement and instruction from outside the classroom. Also, since much of the teacher's time is shared with a

group of students, the composition of the student group may have a significant effect on achievement levels. A recent study shows that students in more homogeneous classes perform better on achievement tests than students from heterogeneous classes.(15)

An important aspect of student-teacher interaction is the amount of time spent together. Two measures of time are available from the New York data. The first is the size of the class. Since teachers' time is shared by students in the classroom, fewer students means that there is more time available for each student. Class size alone does not provide a good indication of the impact of time on achievement. However, the effect of class size depends upon the class arrangement and the instructional strategy of the teacher. Teachers who devote a large part of the class time to individual instruction will be able to spend less time with each student as the class size increases. Teachers, on the other hand, who primarily provide instruction to the entire class simultaneously will be less affected by class size.

The various factors listed above are entered into two linear reduced-form equations for the mean and standard deviation of student test scores derived from maximizing the student welfare function subject to the production constraints. The equations are derived in Chapter 3 and reproduced here. The mean and standard deviation of student test scores are written, respectively

$$\bar{S} = K_s + \frac{d\,\alpha}{b\beta^2+d\alpha^2} \sum_{i=1} \gamma_i I_i \tag{24}$$

$$\sigma_s = K_\sigma + \frac{\beta\, b}{b\beta^2+d\alpha^2} \sum_{i=1} \gamma_i I_i \tag{25}$$

where K_s and K_σ are constant terms. If the coefficient of an input is statistically significant in either equation, then the input significantly affects the achievement level of students.

Math and reading scores for grades 3 and 6 are regressed against 1) the percentage of teachers in the district with masters degrees, 2) the experience of the teachers, 3) percentage of parents in the district who have attended college, 4) total enrollment of the district, 5) dropout rate of students in the district, 6) the percentage of students from families on welfare, 7) teacher student ratio, 8) the percentage of schools within the district with traditional class arrangement, 9) nontraditional arrangements such as cluster and open classrooms, and 10) the mode of instruction. The estimates of the production function are shown in Table 4-18. In most cases the results are consistent with the results of other studies. We find that districts with a higher than average percentage of students from families on welfare have lower means and greater standard deviations for nearly all grades and tests. Also, students from districts with a higher than average percentage of parents who have attended college have consistently higher means across both grades and subject area. Consequently, the characteristics of students are a significant factor in explaining the level of student test scores.

Teacher characteristics are also found to contribute to the variation in student test scores. Districts with a higher than average percentage of teachers with masters degrees consistently have higher test scores with statistically significant estimates in all cases. The effect of masters degrees on the dispersion of scores is not consistent. We find that masters degrees reduce the dispersion of reading scores while masters degrees are associated with an increase in the dispersion of sixth grade math

Table 4-18

Estimates of Educational Production Function

INDEPENDENT VARIABLES	DEPENDENT VARIABLES							
	Grade 3				Grade 6			
	Reading		Math		Reading		Math	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Intercept	301.46 (20.63)	121.28 (2.176)	338.78 (19.90)	113.46 (19.38)	342.29 (27.57)	97.96 (18.69)	290.86 (14.92)	106.21 (16.60)
% Masters of Greater	30.59 (2.94)	-7.25 (1.83)	41.26 (3.41)	-2.29 (.55)	17.32 (1.96)	-12.66 (3.40)	42.55 (3.07)	8.95 (1.96)
% Parents College Educated	84.06 (9.49)	-3.17 (.94)	96.22 (9.33)	3.97 (1.11)	74.47 (9.90)	-6.42 (2.02)	85.31 (7.22)	22.87 (5.90)
Total Teaching Experience	.05 (.08)	-.01 (.08)	.10 (.14)	-.41 (1.76)	.17 (.35)	.40 (1.93)	.54 (.68)	.45 (1.74)
Total Enrollment	-.00017 (.38)	-.00025 (1.47)	-.000088 (.16)	-.00002 (.13)	-.00039 (1.03)	.0003 (1.89)	.0009 (1.50)	.00086 (4.38)
Square of Total Enrollment	-1.91 E-8 (1.41)	8.32 E-9 (1.61)	-2.83 E-8 (1.79)	5.64 E-9 (1.04)	-1.30 E-8 (1.13)	-3.53 E-9 (.72)	-4.61 E-8 (2.55)	-2.26 E-8 (3.81)
Dropout Rate	-2.93 (2.71)	.67 (1.63)	-3.37 (2.68)	.29 (.68)	.46 (.51)	.59 (1.54)	-1.10 (.77)	.011 (.03)
% on Welfare	-8.47 (8.78)	1.29 (3.52)	-8.87 (7.90)	2.34 (6.05)	-8.74 (10.67)	1.95 (5.65)	-8.58 (6.67)	-.52 (1.25)
Teacher/Student Ratio	-297.19 (1.45)	-56.00 (.72)	-345.35 (1.45)	-170.33 (2.08)	-477.36 (2.75)	-3.25 (.04)	-164.41 (.60)	-132.20 (1.47)
Traditional	10.25 (1.12)	-6.44 (1.86)	-4.83 (.45)	-5.16 (1.42)	11.56 (1.49)	-5.53 (1.70)	7.56 (.62)	-7.28 (1.83)

Table 4-18 (con't)

Independent Variables	Reading		Math		Reading		Math	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Nontraditional	-7.51 (1.07)	5.21 (1.96)	4.2 (.52)	9.47 (3.39)	-13.28 (2.24)	3.26 (1.30)	-15.18 (1.63)	5.97 (1.95)
Individual	-9.61 (2.50)	2.17 (1.48)	-9.35 (2.09)	2.74 (1.78)	-10.41 (3.19)	2.22 (1.61)	-13.11 (2.56)	.47 (.27)
Individual Supervised Work Study	8.36 (1.92)	-2.08 (1.26)	8.03 (1.59)	-2.33 (1.34)	11.08 (3.00)	-3.81 (2.45)	10.98 (1.89)	.74 (.39)
R^2	.48	.12	.48	.15	.48	.18	.37	.27

t-statistics in parentheses

weighted least squares using square root of enrollment.

scores. Surprisingly, the experience level of teachers is not significant in any of the cases. This is contrary to the findings of many previous researchers. In fact, Murnane reports entirely opposite findings. In the studies he examined, experience level of teachers prove to be significantly related to test scores whereas very little correlation is found between masters levels and test scores.

Although the teacher student ratio does not vary much across school districts, we do find that districts with smaller than average class size have a lower dispersion of test scores accompanied by lower means. The result is somewhat counterintuitive since we would expect smaller class size to increase the means of student test scores due to the increase in time available for individual students. However, as mentioned earlier, smaller class size only benefits students when the teacher spends a large portion of the time in individual instruction. The activity in the classroom is measured by the arrangement of the class and the type of instruction.

When the mode of instruction is taken into consideration, an interesting pattern emerges. Traditional class arrangement in which a single teacher is in charge of the total curriculum offering to the student reduces the standard deviation of test scores but does not significantly affect the mean test scores. Nontraditional class arrangements, such as open and cluster classroom, increase the dispersion of scores and in some cases decrease the mean. Individual instruction shows the same effect as nontraditional class arrangements with a positive influence on the mean and a negative effect on the standard deviation. The similarities between nontraditional and individual instruction can be partially explained by the significant positive correlation between the two modes. We find that

districts with a higher proportion of nontraditional classes spend a higher proportion of time in individual instruction. It is not surprising that the results should be similar.

The intuition behind the results is less apparent. It may be the case that classrooms which stress self-motivation and individualized programs may be neglecting the average student by helping the slower learners and encouraging the high achievers. Traditional classrooms, by attempting to achieve a minimum standard of achievement and providing less encouragement to higher achievers, may be promoting a more homogeneous distribution of test scores.

Collective Bargaining and Teacher Attributes

Given the relationship between educational inputs and student test scores, it becomes apparent that collective bargaining can affect the quality of education through its impact on inputs which are significantly correlated with test scores. Without resorting to the more complicated procedure of estimating the two relationships simultaneously, we can demonstrate the effect of contract items on test scores by tracing through the various effects. The first step in this procedure is to identify the inputs which are shown to be significantly related to test scores. We have shown that the educational attainment of teachers and the mode of instruction are two inputs which are signifcantly related to test means while at the same time they are inputs which are determined by administrators and teachers.

Once the significant inputs are identified, the next step is to find the specific contract items which significantly affect the level of these inputs. Consider the percentage of teachers with masters degrees. Earlier

we showed that only two contract items significantly affect the percentage of teachers with masters degrees. They are the class size provision and the teacher preparation provision. Therefore, since teachers with masters degrees are more effective in raising test scores than teachers without the degree, we can conclude that these two contract provisions increase the quality of education.

In addition to the education of teachers, class arrangement and instructional mode also significantly influence test scores and thus may be a vehicle through which contract items can affect educational quality. In order to examine the correlation between contract items and class arrangement and instructional mode, the three organizational variables are regressed against contract items and other factors which may determine the adoption of these modes by a district. The results are also shown in Table 4-19. We find that the occurrence of traditional classroom organization is positively correlated with class size provision and teacher preparation provision. Cluster classrooms are positively correlated with educational policy committees and individual instructional mode is negatively correlated with class size provision. Consequently, districts with the class size provision will have more homogeneous test scores since this provision positively affects the occurrence of traditional classrooms which in turn reduces the disperison of test scores. The effect of the class size provision on the distribution of test scores is further substantiated by the negative relationship with the individual instruction mode which subsequently has a positive correlation with the standard deviation of test scores.

The teacher preparation provision reduces the dispersion of test scores through the effect of traditional class arrangement on the standard

Table 4-19

Determinants of the Propensity of Districts in New York To Use Various Class Arrangements, 1976-79

Explanatory Variables	Traditional	Cluster	Open
Percent Master or Greater	-.11 (1.87)	.15 (1.47)	-.07 (.62)
Average Total Experience	.002 (.77)	.0005 (.09)	.002 (.37)
Teacher Student Ratio	-.96 (.86)	-.50 (.26)	2.60 (1.24)
Total Enrollment	4.2 E-6 (2.57)	5.90 E-6 (2.12)	1.40 E-6 (.47)
Percentage Families on Welfare	.0004 (.08)	-.02 (2.12)	-.007 (.69)
Dropout Rate	.002 (.50)	.002 (.35)	-.009 (1.04)
Operating Expense/Pupil	1.71 E-7 (.93)	1.08 E-7 (.34)	4.64 E-7 (1.35)
Percentage Parents College Educated	-.12 (2.40)	.05 (3.00)	.17 (1.70)
Percentage Instructional Expense	.38 (2.62)	-.74 (2.94)	-.83 (3.05)
Summer Sabatticals Q6	.01 (1.15)	-.03 (1.38)	.009 (.03)
Release Time for Inservice Q21	.006 (.13)	-.09 (1.10)	-.05 (.62)
Payment for Inservice Q22	-.003 (.13)	-.01 (.41)	.04 (.83)
Class Size Provision Q40	.02 (2.67)	-.02 (1.46)	-.003 (.16)
Class Size Impact Q41	.05 (.74)	-.02 (.16)	.42 (2.98)
Tuition Reimbursement Q42	.01 (.47)	-.004 (.09)	-.03 (.64)
Provision for Different Preparations Q43	-.004 (.36)	-.01 (.64)	.0007 (.02)
Educational Policy Committee Q44	-.0005 (.04)	.03 (1.72)	-.006 (.31)
Teacher Preparation Provision Q53	.02 (1.71)	-.009 (.45)	(1.10)
R^2	.09	.08	.09

t-statistics in parentheses

deviation of test scores. Educational policy committees appear to have a negative impact on the mean test scores and a dispersive effect on the distribution of test scores due to its correlation with cluster arrangement. However, the direction of causation from educational policy committees to cluster arrangement may be reversed. It may be the case that districts organized into cluster classrooms may insist on educational policy committees in order to coordinate the activities of teachers. In this case we cannot say that the contract item influences test scores.

We have also shown that districts with a greater than average number of items in their contracts have a higher than average percentage of teachers with masters degrees. We conclude that in addition to specific contract items affecting test scores, the scope of the contract also increases test scores through its interaction with teacher attributes.

Effect of Contract Items on the Behavioral Response of Teachers

Negotiated contracts may affect educational quality through means other than the direct affect on inputs and teacher attributes. By providing a mechanism for teachers to express their preferences about educational policy, working conditions, and grievances, teacher unions can influence the effectiveness of the teacher's time spent in the classroom. Murnane stresses that the behavior of teachers and consequently their productivity is very sensitive to the methods used to allocate resources. Even though administrators might implement certain policies with all good intentions, teachers may react adversely to the policy directives because of differences in preferences.

For example, Murnane suggests the illustration of declining enrollments and teacher layoffs. Districts faced with laying off teachers may

choose to lay off less effective teachers first. Administrators favor this policy because it promises to maintain a higher level of educational quality than would be achieved if reduction is based on seniority or other criterion unrelated to performance. Teachers, on the other hand, may view this policy differently. Some teachers may see this policy as a means of increasing competitiveness with their colleagues and effective teachers may resign because this system diminishes the enjoyment that they derive from the job. Increased competitiveness may reduce the amount of cooperation among teachers which ultimately would decrease their effectiveness as teachers. Finally, administrators may find that the criteria they originally used to identify the more effective teacher is no longer applicable since teachers have altered their behavior substantially.

Many other examples of behavioral responses of teachers to policy changes are imaginable. Effective teacher unions which represent the preferences of their constituents will be instrumental in reducing the adverse impacts of certain policy decisions. This is primarily accomplished by incorporating the preferences of teachers into the formulation of resource allocation mechanisms that will not induce debilitating responses.

The impact of contract negotiations on the behavioral responses of teachers can be investigated by considering the effect of contract provisions on the productivity of certain teacher attributes. In particular, we examine the interaction between various contract items on the experience of teachers and the educational level of teachers. In addition to the various contract items, we also consider the effect of enrollment changes on the effectiveness of teachers. Thus, the productivity of teachers as measured by the coefficient associated with the teacher attribute in the educational production function is expressed as a function of

contract characteristics and enrollment changes. Denoting teacher productivity as α, contract items as Q and enrollment changes as D, we write the productivity function as:

$$\gamma_i = \alpha_o + \alpha_1 Q + \alpha_2 Q*D + \alpha_3 D \quad (24)$$

If α_o is non-negative as is the case with teacher attributes, then the following relationships apply to teachers with a particular attribute. A positive estimate of α_1 indicates that teachers in districts facing declining enrollment which have the contract item Q are more effective in raising test scores (or reducing dispersion) than teachers in districts without the contract item. A positive estimate of α_1 and α_2 together indicates that teachers in increasing enrollment districts with the contract item are more effective than teachers in districts without the contract item. A positive estimate of α_3 indicates that teachers in districts facing increasing enrollments are more effective than teachers in districts facing declining enrollments when neither district has the particular contract item.

Contracts can be characterized in two ways. The first method is to consider the scope of the contracts. We would expect that contracts which contain a greater range of items will be more representative of the teachers' preferences. Therefore, if teacher effectiveness is governed by the extent to which their preferences are incorporated into district policy, we would expect to observe positive estimates of the coefficients related to contract characteristics.

The second method of entering contract characteristics into the equation is to consider individual contract items. We include contract items which cover aspects of the teaching environment such as teacher evaluations, reduction in force procedures, dismissal procedures, class size provision,

teacher preparation, educational policy committees, inservice provisions, and teacher aides.

Selected results are shown in Table 4-20. The most striking result is the lack of significance. Only a handful of estimates are statistically significant at a reasonable level of confidence. There are, however, a few isolated cases in which contract characteristics affect the productivity of teacher attributes. The scope of the contracts appear to have little influence on the impact of teacher attributes on test scores. The only exception is a positive effect on the dispersion of test scores but this is found for only one test.

The individual items show little improvement. The only contract item which consistently influences the correlation between teacher attributes and test scores is the implementation of an evaluation for teachers. We find that teachers in declining enrollment districts which adopt this provision are associated with lower mean scores than teachers in districts without the provision. This holds true for the influence of both the experience level and educational level of teachers on scores. Concurrently, we find that districts with the evaluation provision have a wider dispersion of test scores than districts without the provision.

An explanation of the results may follow closely the illustration offered by Murnane. Administrators may implement the teacher evaluation provision in order to promote the quality of the teaching staff. However, teachers may react adversely to being evaluated because they may feel that they are unduly forced to compete with their colleagues. Teachers can behave in two ways. If evaluations are based upon individual student performance, then teachers may concentrate their effort on a small group of students who may show exceptional ability in order to

Table 4-20

Effects of Contract Items on the Productivity of Teacher Attributes on Student Test Scores

Contract Provisions	DEPENDENT VARIABLES							
	Grade 3				Grade 6			
	Reading		Math		Reading		Math	
Eval. Procedures Q35	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Exp X Declining Enrollment	-1.73 (1.39)	.41 (.88)	-1.64 (1.14)	.64 (.13)	-1.46 (1.36)	.63 (1.42)	-.23 (.14)	.10 (.20)
Q38 X Experience	-1.72 (3.67)	.71 (4.08)	-2.13 (3.96)	2.91 (1.58)	-1.19 (2.95)	.42 (2.53)	-1.42 (2.25)	-.03 (.18)
Exp X Q38 X Declining Enroll.	2.13 (1.65)	-.69 (1.44)	2.13 (1.44)	-1.80 (.35)	1.21 (1.09)	-.70 (1.53)	.24 (.14)	-.11 (.20)
Mast X Declining Enrollment	-.09 (1.23)	.02 (.76)	-.07 (.91)	-.12 (.41)	-.09 (1.43)	.03 (1.42)	-.08 (2.30)	.01 (.30)
Q38 X Masters	-.09 (3.53)	.04 (4.03)	-.12 (3.90)	.16 (1.52)	-.07 (3.01)	.02 (2.64)	.004 (.04)	-.001 (.14)
Mast X Q38 X Declining Enroll.	.11 (1.47)	-.03 (1.22)	.11 (1.24)	-.02 (.08)	.08 (1.21)	-.04 (1.46)	-.20 (.36)	-.009 (.27)
Number of Aides Specified Q19								
Exp X Declining Enrollment	.25 (.67)	-.23 (1.65)			-.33 (1.01)	-.02 (.19)	-.15 (.31)	-.05 (.36)
Q19 X Experience	1.96 (1.98)	-.77 (2.10)			1.41 (1.66)	-.84 (2.42)	1.01 (.77)	-.73 (1.75)
Exp X Q19 X Declining Enroll.	-1.24 (.68)	.46 (.68)			-.49 (.32)	.16 (.25)	4.76 (1.98)	1.83 (2.37)
Mast X Declining Enrollment	.01 (.64)	-.01 1.36				-1.08 E-5 (.001)	-.008 (.26)	-.001 (-.13)

Table 4-20 (con't)

Contract Provisions	Reading		Math		Reading		Math	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Q19 X Masters	.12 (2.08)	-.04 (1.96)				-.05 (2.29)	.06 (.78)	-.04 (1.60)
Mast X Q19 X Declining Enroll	-.07 (.56)	.02 (.40)				-7.9 E-4 (.01)	.36 (2.05)	.12 (2.09)
Provision for Diff. Preps. Exp X Declining Enrollment				-3.99 (2.40)	-.46 (1.26)		-.44 (.77)	
Q43 X Experience				-.82 (.58)	-.57 (1.85)		-.91 (1.88	
Exp X Q43 X Declining Enroll.				7.01 (2.31)	.17 (.25)		1.29 (1.24)	
Mast X Declining Enrollment				-.23 (2.34)	-.02 (1.10)		-.02 (.76)	
Q45 X Masters				-.03 (.39)	-.03 (1.85)		-.05 (1.85)	
Mast X Q43 X Declining Enroll.				.39 (2.09)	.01 (.32)		.08 (1.26)	

demonstrate the effectiveness of the teacher. Thus, the mean will be lower and the dispersion greater. On the other hand, teachers may feel less inclined to cooperate with the administration and other teachers which ultimately reduces the overall performance of students in the district.

Another contract item which exhibits a considerable amount of significance is the teacher aide provision. We find that, in general, teachers in districts which have the provision are associated with higher mean scores and a reduction in the dispersion of scores than teachers without the provision. These results are understandable since teacher aides can assist teachers with individual instruction and with nonprofessional activities such as preparing materials for class. We also find that the teacher aide provision has a larger impact in declining enrollment districts than increasing enrollment districts. Again, this seems reasonable if declining enrollment districts must economize on staff, and employing teacher aides is a way to increase staff at a lower cost.

There may, however, be another side to this provision. Teachers in declining enrollment districts are concerned about job security and the employment of teacher aides is a threat to some teachers. By specifying in the contract the number of teacher aides that can be hired by the district teachers may feel less threatened and are more effective in the classroom.

Besides considering the estimates which are significant, it is interesting to discuss a few of the contract items which are not significant. For instance, we anticipated that reduction in force procedures would have created a much more relaxed working environment especially for teachers in declining enrollment districts. We find no evidence of this in our analysis. A class size provision would also seem to be an important influence on

teacher productivity. Again, the estimates are not statistically significant. Teacher preparation provision is also expected to increase teacher productivity, but the estimates do not bear this out.

It should be emphasized that the method we have chosen to relate the unions' role in eliciting more productive behavioral responses of teachers is an initial attempt at analyzing a complex problem. Murnane emphasizes the importance of this line of research but at the same time stresses the difficulties in answering these questions. Many problems in data collection and methodology plague our study, but we believe that we are progressing in the right direction to begin to answer these questions and have perhaps done as much as is possible within the limitations of a large-scale quantitative study. Therefore, in this light, the results should be interpreted with caution since not all the intricacies of the problem can be explored at the aggregated level. Nonetheless, the results do provide an interesting insight, albeit incomplete, into the effect of contract items on the effectiveness of teachers.

Conclusion

This chapter has examined the effects of collective bargaining agreements on the budgets and educational processes of New York State school districts. We looked not only at the impact of the existence of agreements on resource allocation decisions, but also at the impact of the extensiveness of contract provisions and the specific content of contract provisions on school budgets. Finally, we attempted to tie the resource allocation effects of collective bargaining agreements to the achievement of school children. This task was difficult and complex. Nevertheless, some progress was made in tracing the linkages between resource decisions,

teacher attributes, teachers' behavioral responses to contract provisions, and student achievement.

We now turn to Michigan to see whether our results can be generalized beyond the boundaries of New York State. While every state school system is different and teachers and administrators bargain under different public employee relations laws, we expect to find similarities in the results of collective bargaining among school districts in different states.

Footnotes - Chapter 4

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4. Helsby, p. 60.

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CHAPTER 5 - COLLECTIVE BARGAINING IN MICHIGAN

Introduction

The results obtained for public school districts in New York have yielded many interesting insights into the impact of collective bargaining on the allocation of educational resources, the behavior of teachers, and the test scores of students. Some of the results may, however, be peculiar to the New York education system. As mentioned earlier, New York is one of the first states to enact a collective bargaining law permitting teachers to be represented by unions. Also New York is relatively industrialized in many regions of the state and thus has been accustomed to unionization. Although the results have heretofore been obtained from observing behavior of districts in one state, we contend that the results can be generalized to districts in other states which have somewhat similar characteristics.

In attempting to compare behavior across states, we will replicate the same type of analysis on districts in the state of Michigan. Other states could have been chosen, and indeed the analysis is applicable to districts in every state. However, because of the extensiveness of the analysis and problems of collecting the appropriate data from other states, we have had to limit our investigation to only a single other state. Michigan is well suited to replicate the analysis performed on New York districts. Michigan is similar to New York in that it is a relatively heavily industrialized state but at the same time has many rural communities such as are found in upstate New York.

Michigan's collective bargaining law and traditions are similar to those in New York. The Michigan Public Employee Relations Act (PERA) was signed into law on July 23, 1965, as an amendment to the 1947 Hutchinson Act. The earlier act gave public employees the right to organize and

bargain collectively but did not provide the administrative machinery to effectuate these provisions. It also prohibited public employee strikes, assessing automatic and severe penalties for striking public employees.

The 1965 PERA both provided the missing "administrative machinery" and, while prohibiting public employee strikes, failed to specify penalties for such strikes. Specifically, PERA provides for 1) employee organizations, 2) representation procedures, 3) employee and union unfair labor practices, 4) mediation, and 5) fact-finding. With regard to strikes, the administrative agency for PERA - Michigan Employment Relations Commission (MERC) - and the Michigan courts have, if anything, weakened the prohibition of public employee strikes, especially teacher strikes.

The duty to bargain under PERA is described in language that closely approximates section 8(d) of the National Labor Relations Act. Section 15 of PERA reads in part:

> For purposes of this section, to bargain collectively is the performance of the mutual obligation of the employer and the representative of the employees to meet at reasonable times and confer in good faith with respect to wages, hours, and other terms and conditions of employment, or the negotiation of an agreement, or any question arising thereunder, and the execution of a written contract, ... but such obligation does not compel either party to agree to a proposal or require the making of a concession.

The public school teachers of Michigan have been particularly successful in establishing what is apparently a relatively broad scope of duty to bargain. In 1972, in a landmark opinion (7 MERC op 313 (1972) - Westwood Community Schools) MERC adopted the position that, since strikes by public employees are prohibited, there is no reason to severely restrict the subjects that may be brought up in negotiations. This position was reinforced in subsequent court decisions, such as the Van Buren Case (Van Buren

Public School District vs. Wayne County Circuit Judge, 61 Mich App 6, 232 NW2d 728) which stated:

> Only by requiring mandatory bargaining on a wide range of subjects are public employees' rights protected since, pursuant to section 2, public employees are forbidden to strike.

The above decisions refer to public employees generally, but as a matter of history, they were spawned in large part by teacher disputes, and teacher unions appear to be the only public unions exhibiting interest in establishing a broader spectrum of bargainable issues. This is perhaps due to teachers self-identification as "professionals" for whom "conditions of employment" include areas that management traditionally has viewed as falling exclusively in the domain of management perogatives.

Since 1965, the scope of issues considered negotiable in collective bargaining disputes has gradually broadened. A 1977 study of the scope of teacher bargaining in 14 states showed Michigan to be third (after New York and Oregon) in the number of mandatorily bargainable issues, and to be tied with Nevada and South Dakota for the lowest number of non-permissible subjects of bargaining.

It appears that organized labor in Michigan's public sector is, if anything, even stronger than its counterparts in the private sector. The legal prohibition on public employee strikes has provided a rationale for MERC and the courts to be lenient on the issue of scope of duty to bargain. On the other hand, since the law provides no explicit sanctions for public employee strikes, there have been numerous public employee strikes, especially by teachers which have been virtually unpunished. This has had the effect of broadening the scope of bargaining even beyond what might have occurred had public employee strikes been permitted.

Data comparable to that used for New York are available from the

Michigan State Department of Education and the Michigan Education Association. There are some data deficiencies which prevent us from performing all aspects of the analysis reported for New York. Despite these shortcomings, the analysis of Michigan public school districts provides an interesting means of replicating the findings of the previous chapter and to compare the impact of collective bargaining between states.

Characteristics of Michigan School Districts

Approximately the same percentage of school districts in Michigan are represented by recognized collective bargaining units as are represented in New York. However, unlike New York, which is dominated by local bargaining units affiliated with the American Federation of Teachers, most of the bargaining units in Michigan are affiliated with the National Education Association. The Michigan Education Association, the statewide affiliate of NEA, reports that 508 of the approximately 600 K-12 and intermediate school districts are affiliated with MEA, 24 districts are affiliated with MFT, and 16 are represented by independent bargaining units. Teachers in the remaining districts are not represented by any recognized bargaining unit.

Since MEA affiliated districts are predominate in Michigan, we will concentrate the analysis on MEA districts. The only problem with this approach is that the Detroit school district is represented by the MFT. However, Detroit is excluded from the analysis for reasons other than its union affiliation. Since Detroit, like New York City, is so much larger than the other districts in the state, it is unreasonable to assume that it behaves the same as the other districts.

Information on Michigan school districts comes from two sources. Data related to district finances, student characteristics, test scores, and

teacher characteristics come from information collected by the Michigan Department of Education. Information related to contract items comes from the Michigan Education Association. Each of the 508 contracts of MEA affiliated districts are analyzed by recording the presence or absence of various contract provisions. Since most of the districts in the state are affiliated with MEA, we foresee little problem with including only MEA districts in the analysis when analyzing the impact of individual contract items.

The characteristics of the Michigan school districts are displayed in Table 5-1. Districts are smaller on average than districts in New York and spend less per pupil than New York districts. The lower expenditures are reflected in lower average teacher salaries and larger average class size. We also find that a smaller percentage of teachers in Michigan have masters degrees and the average years of experience are also lower when compared with teachers in New York.

Although most districts in Michigan have bargaining units, it is instructive to examine the differences in characteristics between the union and nonunion districts. Table 5-1 shows that union districts have larger enrollments by about three to one, while the total operating expense per pupil is roughly comparable differing by less than $40 per pupil. Nonunion districts spend a slightly smaller percentage of their total budget on instruction. Salaries are lower in nonunion districts which could partially be the result of a lower percentage of teachers with masters degrees and less experience. Lower salaries may also be attributed to the fact that 83 percent of the nonunion districts are in rural communities compared with only 60 percent of the union districts. Also, a much smaller percentage of nonunion districts are found in cities and suburbs than union districts.

Table 5-1

Characteristics of Michigan School Districts Means, 1976-77

District Characteristics	All Districts	Union	Nonunion
Enrollment	2,879	3,012	1,196
Operating Expense per pupil	1,071.52	1,074.08	1,038.94
Instructional Expense per Pupil	730.33	737.30	686.36
Employee Benefits per Pupil	9.99	9.93	11.15
Salaries per Pupil	525.89	530.60	497.00
Other Expense per Pupil	352.06	351.43	370.55
Average Salary	11,932.00	12,100.00	10,792.00
Percentage of Teachers w/Masters	25.22	25.84	21.02
Average Years Experience	8.32	8.54	6.72
Number of Teachers	121	127	54
Teacher Student Ratio	.0445	.044	.047
Dropout Rate	6.1	6.4	5.57
Percent Minority Students	6.17	7.54	6.62
Percent Parents College Educated	20.1	20.3	16.57
Percent Urbanized	35.2	36.0	21.48
Family Size	2.53	2.53	2.54
Percent Families with Children	58.8	58.8	58.26
Percent Change in Enrollment	-8.1	-8.2	-7.88
Percent Change in Instructional Expense	26.39	26.3	27.48
Percent Change in Masters	12.83	13.3	6.2
Percent Change in Experience	1.55	2.4	-8.5
Percent Change in Teachers	-5.36	-5.2	-7.4
Percent Change in Teacher Student Ratio	3.80	4.0	1.2
Percent Change in Average Salary	11.85	12.0	10.57
Percent Change in Total Salaries	15.65	16.0	11.8

Another interesting comparison is the change in district characteristics over the past couple of years. We have computed the percentage change for a number of variables between the 1972-73 and 1976-77 school years. Enrollment has fallen for both union and nonunion districts by roughly the same rate of 8 percent over the 5 year period. The number of teachers has fallen by a slightly slower rate with nonunion districts losing a slightly higher percentage than union districts. It is interesting, however, that the rate of reduction in teachers has not kept pace with the decrease in enrollment which results in an increase in the teacher student ratio since 1972. During this time, union districts were able to keep a larger staff in relation to enrollment than nonunion districts. This results in an increase in the teacher student ratio of almost 3 percent more in union than nonunion districts.

An interesting phenomenon emerges with regard to the turnover in teachers. We find that although nonunion districts are experiencing a 7.4 percent decrease in the number of teachers, the average years experience has decreased by 8.5 percent. Union districts, on the other hand, face a 5 percent decrease in teachers but a 2.4 percent increase in experience level. It appears that unions are retaining more senior teachers by not hiring as many junior teachers while nonunion districts are releasing more experienced teachers and replacing them with less experienced and less costly teachers.

The difference in changes in education levels of teachers substantiates the notion that union districts retain more senior faculty than nonunion districts. Analysis reported later in this chapter addresses this problem in more detail.

In the previous chapter we hypothesize that collective bargaining will have a greater impact in districts facing declining enrollments than districts experiencing increasing enrollments. Public school districts in Michigan experienced an even greater decline in enrollment than districts in New York between 1972 and 1976. Only 8 percent of the Michigan districts included in the sample experienced any increase in enrollment over the 5 year period whereas over 20 percent of the New York districts recorded increases. Michigan districts that reported increases in enrollment averaged 9 percent more students while declining enrollment districts lost 10 percent of their students.

The characteristics of declining and increasing enrollment districts differed significantly in many instances, as is shown in Table 5-2. Declining enrollment districts are generally much larger than increasing enrollment districts and are found much more frequently in towns and rural communities. Despite the loss of students, declining enrollment districts spend close to $40 more per student than increasing enrollment districts, pay higher salaries to teachers, have a slightly older and more educated staff, and spend a slightly higher percentage of the total budget on instruction.

It is also interesting to compare the percentage changes in inputs between the two types of districts. Declining enrollment districts have a higher percentage increase in instructional expenditures than increasing enrollment districts. This is partially explained by the fact that the percentage reduction in the number of teachers in declining enrollment districts is 3.3 percent less than the percentage reduction in students. Increasing enrollment districts had only a 1.2 percent differential between the two percentages. This results in declining enrollment districts

Table 5-2

Mean Value of Michigan District Enrollments by Change in Enrollment, 1976-77

	Decline	Increase
Enrollment	2,987	1,875
Operating Expense per Pupil	1,075.48	1,034.82
Instructional Expense per Pupil	740.26	671.76
Employee Benefits per Pupil	10.05	9.67
Salaries per Pupil	531.66	492.75
Other Expense per Pupil	351.43	364.67
Average Salary	12,234	11,315
Percentage of Teachers with Masters	25.79	22.63
Average Years Experience	8.53	7.15
Teachers	126	80.66
Teacher Student Ratio	.044	.0441
Dropout Rate	6.2	5.5
Percent Minority	6.44	3.66
Percent Parents College Educated	20.2	18.89
Family Size	2.52	2.61
Percentage Families with Children	58.9	58.13
Percent Change in Enrollment*	-10.1	9.2
Percent Change in Instructional	26.9	21.38
Percent Change in Masters	13.2	8.8
Percent Change in Experience	2.7	-8.9
Percent Change in Teachers	-6.8	7.6
Percent Change in Teacher Student Ratio	4.2	-0.15
Percent Change in Average Salaries	11.9	11.9
Percent Change in Salaries	16.1	11.7
Percent Urbanized	36.9	16.2

*Percentage Change calculated between 1972 and 1976.

actually experiencing an increase in the teacher student ratio of 4.2 percent while increasing enrollment districts recorded a slight decline in the teacher student ratio. Both types of districts, however, had the same percentage increase in average salaries but because of the ability to maintain a larger teaching staff, declining enrollment districts spent an additional 3.3 percent on total salaries.

The turnover of teachers in declining enrollment districts appears to affect primarily the younger less experienced teachers. We find that the 6.8 percent decline in teaching staff resulted in a 2.7 percent increase in the average years of experience and a 13.2 percent increase in the percentage of teachers with masters degrees. Clearly, more experienced staff is being retained at the expense of the younger, less experienced teachers.

Union representation is fairly even over the two types of districts. Roughly, 93 percent of the declining enrollment districts are represented by recognized bargaining units while nearly 90 percent of the increasing enrollment districts are represented. Bargaining units affiliated with the MEA account for 84 percent of the declining enrollment districts, but only 75 percent of the increasing enrollment districts. The composition of the contracts of bargaining units between the two district types differ only slightly. Table 5-3 shows that the most noticeable difference is the slightly higher occurrence of staff reduction related provisions in declining enrollment districts than increasing enrollment districts.

Table 5-3

Percentage of Michigan School Districts with Selected Contract Items by Change in Enrollment, 1976-77

Labor Jurisprudence	All	Declining	Increasing
Staff Reduction Based on Seniority	73.0	73.6	67.9
Staff Reduction Based on Certification	71.0	71.4	64.3
Staff Reduction is Grievable	66.0	66.4	60.7
Recall Based on Inverse Order of Reduction	61.0	60.6	60.7
Working Conditions			
Class Size is Limited	50.1	50.1	51.8
Class Size Relief: Add Teachers	7.5	7.3	8.9
Class Size Relief: Add Aides	19.5	19.5	19.6
Aides Relieve Teachers of Nonprofessional Duties	22.3	22.2	23.2
High School Prep Period	67.3	68.2	58.9
Elementary Prep Period	37.8	37.6	39.2
Duty-Free Lunch	68.8	69.5	62.5
Union Strength			
Payment of Dues	57.5	56.9	62.5
Enforcement Procedures	58.0	58.5	53.5
Release Time For Officers	8.5	8.5	8.9

Nonunion Determinants of School District Expenditures

As mentioned in the introduction of this chapter, the analysis of Michigan public school districts follows closely the analysis of New York districts except for cases in which comparable data are not available. The exceptions include a detailed analysis of the mobility of teachers and the use of the scope of the contracts to explain differences in resource allocation. Also, the teacher effectiveness model for Michigan does not contain variables which describe class arrangement or the mode of instruction. Despite the exclusion of certain aspects of the New York analysis, the Michigan analysis provides an informative complement to the previous results.

Educational resources in Michigan school districts are divided into categories similar to those used in New York. The financial data for each district is obtained from the Annual School District Financial Report collected by the Michigan Department of Education. Expenditures are divided into 1) total instruction, and 2) supporting and community services. The first category includes the total salaries of the instructional staff and expenditures on employee benefits. The second category includes expenditures on counseling and guidance services, pupil transportation, and general administrative activities. In order to examine the affect of collective bargaining on the composition and compensation of the instructional staff, we have divided total expenditures on salaries into the teacher student ratio, average salary, and the percentage of teachers with masters degrees and average years of experience.

The financial categories and educational inputs for Michigan school dsitricts are regressed against the same set of explanatory variables as the New York districts. Table 5-4 displays the results of the estimation.

Table 5-4

Educational Demand Equations for Michigan School Districts, 1976-77

Independent Variables	Inst/Pupil	Benefits/P	Sal/Pupil	T/S	Ave. Sal.	Other/Pupil	Mat/Pupil	% Masters	Ave. Exp.
I	5.68 (281.25)	1.79 (16.16)	5.64 (171.65)	-3.41 (132.30)	9.05 (312.74)	5.04 (104.45)	1.40 (11.29)	1.94 (13.71)	1.59 (18.29)
Op Exp/Pupil	.00082 (39.7)	.00042 (3.73)	.00059 (17.62)	.00033 (12.64)	.00026 (8.75)	.00087 (17.59)	.00005 (.38)	.00087 (6.02)	.00046 (5.21)
Enrollment	.000014 (8.50)	.000018 (1.94)	.000004 (1.28)	-.000025 (11.77)	.000029 (11.94)	-.000028 (6.96)	-.00008 (7.87)	.000086 (7.31)	.000014 (1.90)
$(Enroll)^2$	-3.92 E-10 (6.53)	-5.90 E-10 (1.79)	-1.93 E-10 (1.98)	5.97 E-10 (7.80)	-7.91 E-10 (9.20)	8.05 E-10 (5.62)	2.09 E-9 (5.68)	-2.37 E-09 (5.64)	-4.35 E-10 (1.69)
Dropout	.042 (.48)	-.39 (.83)	-.17 (1.23)	-.157 (1.43)	-.015 (.12)	.076 (.37)	-.24 (.45)	.36 (.59)	.14 (.38)
% Min	.0002 (.66)	.0017 (1.26)	-.00097 (2.46)	-.0005 (1.64)	-.00046 (1.34)	-.00052 (.91)	.00040 (.27)	-.0039 (2.32)	.00005 (.05)
% Par Coll	.064 (2.11)	-.05 (.28)	.047 (.96)	-.022 (.58)	.070 (1.60)	-.163 (2.24)	.57 (3.06)	.768 (3.60)	.08 (.62)
R^2	.89	.09	.54	.37	.55	.45	.16	.39	.14
F	646.6	7.95	94.55	48.58	100.91	66.59	15.50	52.31	13.34
SSE	1.50	45.14	3.97	2.45	3.08	8.56	56.36	73.74	27.65

We find that all financial categories increase with an increase in the total operating budget per pupil. Instructional expenditures and support services have the same elasticity whereas the elasticity on salaries is substantially smaller. We also find that an increase in enrollment increases all categories except support services which may indicate that larger districts achieve economies of scale in providing administrative and pupil services. On the other hand, we find that districts with larger than average enrollments have smaller teacher student ratios. Larger than average districts also pay higher average salaries, and since the magnitudes of the coefficients on average salary and teacher student ratio are roughly the same, we can conclude that the two offset each other. This conclusion is substantiated by the insignificant effect of enrollments on total salaries per pupil. Student characteristics appear to have very little effect on resource allocation except that districts with higher than average percentage of minority students spend less on total salaries primarily due to smaller teacher student ratios. Also, these districts have a lower percentage of teachers with masters degrees.

Districts which have higher regard for education as reflected in a higher than average percentage of parents with a college education tend to spend more on instruction, less on support services, and hire a larger percentage of teachers with masters degrees. All three results are as we expected.

Since we are concerned primarily with how the total budget is allocated to the various resources, it is interesting to examine the distribution of a dollar increase in total budget to the various financial categories. The estimates in Table 5-4 are easily transformed into dollar terms. For every one dollar increase in total funds, $0.61 goes to instruction and $0.31 goes

to support services. One half of the $0.61 for instruction goes to teacher salaries and the rest goes to employee benefits and miscellaneous.

Collective Bargaining and Resource Allocation in Michigan School Districts

The impact of collective bargaining on resource allocation in Michigan public schools will be examined in a number of steps. The first step is to examine the differential behavior of districts which are represented by formal bargaining units including not only MEA affiliated units but also districts which are represented by the Michigan Federation of Teachers and independent units. The second step is to consider the difference in behavior of MEA affiliated districts and all other districts. Since only contracts of MEA affiliated districts are analyzed, the distinction between the aggregate behavior of MEA affiliated districts and non-MEA districts provides an interesting preview of the impact of individual contract items. The third step replaces the aggregate distinction between MEA and non-MEA districts with a measure of the presence of various contract items. This step allows us to see which contract items are responsible for the behavior shown in the previous step.

As in the New York analysis, we distinguish between declining and increasing enrollment districts when examining the impact of collective bargaining on resource allocation. The first step in the analysis is to examine whether or not unionized districts in general behave differently from nonunionized districts. Even though Michigan is dominated by unionized school districts which may lead to extensive spillover effects, some interesting distinctions between the two types of districts emerge from the analysis. Table 5-5 shows the effect of unionization in declining and increasing enrollment districts in dollar amounts. We find that unionization has no significant effect on the allocation of resources

Table 5-5

Union Effect on Budget Allocation in Increasing and Decreasing Enrollment Districts in Michigan, 1976-77*

	Inst/Pupil**	Other/Pupil	Salaries/Pupil	Benefits/Pupil	T/S	Ave Sal	Masters	Experience
Total Operating Budget/Pupil	.606 (35.89)	.314 (16.31)	.306 (15.67)	.002 (2.79)	.371 (11.86)	.251 (7.15)	.812 (4.71)	.431 (4.17)
Union Effect in Decreasing Enrollment Districts	.007 (.95)	-.003 (.36)	.008 (.81)	.001 (1.87)	-.016 (1.06)	.031 (1.86)	.147 (1.81)	.051 (1.05)
Union Effect in Increasing Enrollment Districts	-.013 (.53)	.005 (.18)	-.051 (1.87)	.001 (.43)	-.037 (.84)	-.065 (1.32)	.135 1.56	.096 (.66)
R^2	.89	.46	.55	.11	.38	.56	.40	.19

*Estimates of enrollment, dropout rate, minority, and percentage parents college educated not shown.

**Estimates are in dollar values except for teacher student ratio, average salary, masters, and experience levels which are expressed as elasticities.

to instruction, support services, or salaries. Unionization does, however, raise the average salary of teachers while at the same time decreasing the teacher student ratio although only slightly. The net result leaves total expenditures on salaries unaffected. The impact of unionization in increasing enrollment districts is considerably different. Districts which are unionized spend $0.05 less per pupil on total salaries than non-union districts. This is primarily the result of a reduction in both teacher student ratio and average salary for unionized districts. Therefore, unions appear to be more beneficial to teachers in declining enrollment districts than increasing enrollment districts.

The estimates of the impact of unionization on resource allocation should be viewed with some caution since the possibility of spillover efforts may introduce bias. Since only a handful of districts are not formally represented by a bargaining unit, the distinction between unionized verses nonunionized districts becomes increasingly obscure. The important distinction lies in the scope and content of the individual contracts. The examination of the impact of individual contract items on resource allocation constitutes the major emphasis of the analysis.

Since records of individual contract items come from MEA districts only, it is interesting to look at the impact of MEA contracts as a whole on the allocation of resources before examining the effects of individual contract items. Table 5-6 displays the estimates when differentiating between districts covered by MEA contracts and districts that are not. We find that MEA contracts have no significant effect on the allocation of funds to instruction in either increasing or decreasing enrollment districts. However, we do find a significant impact on total salary expenditures in decreasing enrollment districts. MEA districts allocate

Table 5-6

Comparison of Differences in the Allocation of Resources Between MEA and non-MEA Michigan Districts, 1976-77

Explanatory Variables*	Inst/Pupil**	Other/Pupil	Salaries/Pupil	Benefits/Pupil	T/S	Ave Sal	Ave Exper	Masters
Total Budget	.62	.308	.323	.004	.346	.310	.531	1.01
	(39.23)	(17.12)	(17.73)	(3.80)	(11.84)	(9.63)	(5.54)	(6.27)
Impact of Contracts on Declining Enrollment Districts	-:007	.006	-.014	-.000	.020	-.049	-.083	-.106
	(1.41)	(.97)	(2.39)	(.03)	(2.05)	(4.59)	(2.65)	(2.02)
Impact of Contracts on Increasing Enrollment Dists.	.028	-.002	.021	.000	-.010	.052	.094	.191
	(1.25)	(.10)	(.81)	(.00)	(.26)	(1.16)	(.71)	(.85)
R^2	.89	.46	.55	.10	.39	.58	.19	.40

*Only union related explanatory variables are shown in the table. See Table 5-4 for the coefficients of the other variables included in the demand equations.

**T-statistics in parentheses.

fewer funds to salaries and slightly more to materials and supplies. The lower expenditure on total salaries is explained by the lower average salaries paid to teachers in MEA districts. The lower salaries are partially offset by a higher teacher student ratio. However, the tradeoff is not complete since the decrease in expenditures going to average salaries is over twice the increase going to bolster the teacher student ratio. The net result is a reduction in expenditures on total salaries.

Individual Contract Items and Resource Allocation

The results described in the previous paragraph are the result of the impact of certain items contained in the contracts. Therefore, the next step in the analysis is to examine which contract provisions are responsible for the effects observed above. Ten individual contract items are entered separately into the resource allocation equations.

Table 5-7 shows a very interesting pattern of results. The first thing to notice is that all contract items will affect a particular resource category in the same direction. For example, districts with a contract containing any one of the ten items have lower than average expenditures on total salaries. However, not all of the contract items are significant which indicates that it is not simply the presence of an MEA contract, regardless of its content, that is important, but rather it is the content of the contract that affects the allocation of resources.

Since individual contract items are instrumental in redirecting the allocation of resources, it is interesting to compare the effects of a number of contract items which New York and Michigan school districts have in common. The first contract item to be considered is the reduction in staff procedure. Recall that in New York, districts which contain a reduction in force provision spend more on salaries per pupil than districts

Table 5-7

Impact of Contract Items on Resource Allocation in Michigan Districts

With Declining and Increasing Enrollments, 1976-77

	Inst/Pupil		Other/Pupil		Salaries/Pupil		Benefits/Pupil		T/S		Ave. Sal.		% Masters or Greater		Ave. Exper.	
	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+
Payment of Dues	-.004	-.0008	.002	.019	-.107	.003	-.00002	.001	-.007	.007	-.015	.0004	-.030	.145	-.051	.095
	(1.00)	(.50)	(.44)	(1.14)	(2.40)	(.16)	(.10)	(1.10)	(.95)	(.24)	(1.85)	(.10)	(.76)	(.95)	(2.12)	(1.04)
Staff Reduction Based on Seniority	-.004	.008	.002	.011	-.003	.031	.00009	.0005	.015	.015	-.021	.046	-.028	.358	-.047	.025
	(.90)	(.43)	(.32)	(.55)	(.56)	(1.49)	(.28)	(.38)	(1.88)	(.46)	(2.32)	(1.25)	(.65)	(1.99)	(1.77)	(.23)
Staff Reduction Based on Certification	-.004	-.011	.0005	.019	-.003	.013	-.00003	.000	.013	.019	-.019	.008	-.003	.348	-.036	.0001
	(.89)	(.70)	(.16)	(1.01)	(.68)	(.68)	(.91)	(0.00)	(1.70)	(.62)	(2.29)	(.23)	(.08)	(2.19)	(1.42)	(.001)
Staff Reduction is Grievable	-.002	.004	.0006	-.003	-.010	.016	-.0003	.0004	.005	.039	-.026	.013	-.053	.195	-.039	.100
	(.46)	(.25)	(.13)	(.18)	(2.34)	(.97)	(.94)	(.35)	(.65)	(.71)	(3.25)	(.44)	(1.33)	(1.34)	(1.67)	(1.14)
Recall Based on Inverse Order of Reduction	-.003	.023	.0002	.030	-.005	.015	.00004	.000	.004	.044	-.014	.013	-.019	.043	-.025	.085
	(.69)	(1.58)	(.05)	(1.87)	(1.21)	(.93)	(.35)	(0.00)	(.59)	(1.64)	(1.89)	(.44)	(.54)	(.30)	(1.12)	(.98)
Class Size is Limited	-.005	.019	.006	-.014	-.009	.013	.0002	.0003	-.013	-.004	-.005	.032	-.027	.165	-.029	-.025
	(1.47)	(1.41)	(1.58)	(.94)	(2.14)	(.87)	(.64)	(.27)	(1.96)	(.18)	(.66)	(1.13)	(.74)	(1.22)	(1.33)	(.31)
Class Size Relief - Add Teachers	-.0006	.038	-.001	.024	-.011	-.032	.0002	-.001	.008	.005	-.030	.060	-.130	.125	-.079	.051
	(.10)	(1.76)	(.15)	(1.10)	(1.57)	(1.57)	(2.56)	(.09)	(.70)	(.16)	(2.41)	(1.57)	(2.16)	(.66)	(2.07)	(.45)
Class Size Relief - Add Aides	-.003	.008	.0005	.004	-.008	.010	.0007	-.0001	.005	.051	-.021	.018	-.067	.017	-.015	.069
	(.63)	(.43)	(.49)	(.22)	(1.61)	(.22)	(2.42)	(.11)	(.65)	(1.91)	(2.40)	(.63)	(1.51)	(.12)	(.59)	(.79)
Elementary Prep Period	-.002	.015	.021	.027	-.006	-.006	.0005	-.0004	.001	-.003	-.014	.011	-.027	.015	-.053	-.071
	(.55)	(1.21)	(2.02)	(.65)	(1.55)	(.45)	(1.81)	(.44)	(.19)	(1.18)	(1.92)	(.42)	(.75)	(.12)	(2.45)	(.94)
High School Prep Period	.0007	.005	-.0004	.006	-.008	.009	.0002	.001	.005	.005	-.021	-.012	-.028	.097	-.039	.120
	(.20)	(.39)	(.08)	(.37)	(1.72)	(.54)	(.68)	(1.31)	(.62)	(.20)	(2.52)	(.42)	(.69)	(.70)	(1.62)	(1.44)

without the provision. The higher payroll costs are the result of significantly higher average salaries paid to teachers without any reduction in the teacher student ratio.

Michigan school districts respond to reduction in force provisions in an opposite way. Declining enrollment districts with this provision pay lower average salaries but maintain a larger staff per student than districts without the provision. This is especially true for reduction in force provisions based on seniority.

However, it appears that the larger staff is not necessarily comprised of more senior teachers. On the contrary, we find that teachers in districts with the seniority provision have fewer years experience on average than teachers in districts without the provision. Thus, part of the reason for lower average salaries is the lower average experience possessed by the teaching staff. Therefore, the results do not necessarily mean that districts with the seniority provision offer lower salaries for comparable teachers than districts without the seniority clause. Rather, districts with the seniority clause are able, for one reason or another, to replace senior teachers with less experienced ones. The nature of the turnover in teacher personnel is somewhat peculiar given the intent of a seniority clause, but the results appear to be consistent with the findings reported for New York.

Another contract provision which ellicits different responses from districts in the two states is that related to teacher preparation. In New York teacher preparation provisions have little impact on the allocation of resources whereas in Michigan teachers covered by this provision receive a lower salary on average. This is partially a reflection on the less experienced staff associated with this provision, but also suggests

a substitution of teacher preparation for higher salaries.

Michigan and New York districts respond in a similar fashion to a number of provisions. Two provisions that are particularly prominent are the recall provision and class size provision. The similarity in responses to the recall provision are more evident in increasing enrollment districts than declining enrollment districts. This is primarily due to the fact that recall provisions have very little significant impact in declining enrollment districts since those districts do not have much opportunity to rehire laid off teachers. In both states, districts which have the provision allocate more funds to instruction. However, dissimilarities do appear. Districts in Michigan are able to achieve a slightly higher teacher student ratio and higher average salaries, an accomplishment not matched in New York. Part of this difference may be explained by the greater emphasis placed on recall provisions in Michigan than New York. Over 60 percent of the districts in Michigan have this provision whereas only 12 percent of the New York districts negotiate this item.

Similarities in the response of districts to the class size provision occur primarily in declining enrollment districts. We find that districts in both states have a lower than average teacher student ratio when covered by a class size provision than when not. However, in Michigan the reduction in the teacher student ratio is significant enough to bring about a reduction in payroll costs as well.

When comparing the effects of contract items in Michigan and New York, some interesting observations can be made. First, we find that bargaining units in Michigan are able to negotiate contract items which provide direct benefits to teachers only after making concessions in other areas. This is evident in the fact that none of the contract items significantly

affect the allocation of resources to instruction whereas a number of items cause an increase in funds to administrative and support services. Consequently, teachers who achieve greater job security by negotiating a reduction in force provision or a smaller class size provision must accept lower average salaries.

Teachers in New York, on the other hand, appear better able to negotiate these provisions without compromising other benefits. For instance, teachers who negotiate particular provisions are able to increase the amount of funds going to instruction and salaries at the expense of funds spent on administrative and support services. A good example of the ability of unions in New York to direct the allocation of funds to personnel related resources is found in the case of reduction in force procedures. Districts with this provision are able to avoid any significant lay offs while increasing the average salary by maintainig more senior teachers. Districts are able to meet the increased payroll costs only by spending less on administrative and support services. Districts in Michigan with the seniority clause retain a higher teacher student ratio than districts without the provision only by replacing more senior teachers with less experienced ones.

The difference across states in behavioral responses to certain contract items may be partially explained by the difference in goals of the two dominant unions in each state. It appears that unions in Michigan are more concerned with staff reduction than districts in New York and are thus willing to make compromises to achieve job security. This difference in preferences is supported by the fact that contracts in Michigan contain items related to staff reduction much more frequently than contracts in New York. In fact, the difference is more than 2 to 1 in some instances.

Other explanations may center around the statutory environment of the two states and the nature of the bargaining process. These issues will be addressed in more detail in the next chapter.

CHAPTER 6 - WHERE DOES THIS LEAVE US?

Introduction

What have we learned from this examination of unions and public schools? If we cast away the paraphenalia of input-output analysis and educational production functions, are there lessons here for those who are concerned with education in public schools? All too often policy analysts and researchers develop their own mystiques, and administrators and politicians have a tendency to act as if they understand them. Status is frequently conferred, these days, on those seeming to be participants in the newest mysteries.

The purpose of this study has been to unveil some of the mysteries surrounding the role of unknowns in schools. In reviewing these findings a reader must have realistic expectations. If they are too high, the results will seem disappointingly modest. However, if one compared our results with the existing knowledge of teachers and unions, then the results make an important contribution to our knowledge of bargaining. We can say with confidence that collective bargaining changes decision making in public education in ways that affect the educational process. The influence of collective bargaining on the rate of learning is now a little less "unknown" than it was when McDonnell and Pascal concluded that we knew very little about such effects.

The effects of collective bargaining on the educational process have remained a mystery for three principal reasons. The first two of which continue to shroud our results. First, education is an imprecise activity. Unlike many technical processes in which the relationships between inputs and outputs are well known, what is involved in educating students still remains unclear. For learning to occur, there must be students able and willing to learn and teachers with sufficient knowledge and training in

proximity to the students. Educational effectiveness studies cast some light on the relationships between student and community attributes, teacher characteristics, peer group relationships, instructional methodologies, etc. and student achievement. Yet, it is accurate to say that we do not know how to package these various inputs so as to guarantee that learning will occur. A combination of inputs with some students works, while the same combination with others fails. Attempts to measure the impact of an event or occurrence, such as collective bargaining, on a process which itself is not well understood, necessarily produces uncertain results.

A second reason for our difficulty in isolating the effects of collective bargaining in public education is that collective bargaining is just one of many factors which shape the learning process. Education occurs in a context of established routines, educational traditions, federal, state and district laws and procedures, and immediate circumstances. Collective bargaining, at the most, would affect what goes on in schools in small ways. To date, social science has not been sufficiently developed and precise to measure small differences in the operation of social institutions. The problem is further complicated by the expectations of the parties involved. Union proponents believe collective bargaining substantially improves public education. They are disappointed that research cannot confirm this belief. Union opponents assert that unions threaten the very survival of public education. They too are disappointed with evidence that shows much less is actually at stake. All of this is a way of saying that progress in understanding the role of unions in schools will be made only if we recognize the limitations involved in making such an assessment and consequently do not expect more than can possibly be delivered.

A third and important reason why the effect of collective bargaining on the educational process has been ignored has been the lack of a convincing theoretical argument as to why unions should make a difference. The critiques of collective bargaining are almost always made on legal or financial grounds, not on educational ones. Unions diminish democracy by reducing the discretion of democratically elected officials and their representatives. Unions have disproportionate power and therefore receive higher than optimal wages for their members or a disproportionately large allocation of public funds for public education. Neither of these frequently heard arguments is based on an understanding of how collective bargaining affects the education of children.

Our first task in this study has been to present a theory of the role of unions in educational decision making. It states that collective bargaining in public education will make a difference when the preferences of the average teacher and the preferences of the school administration differ on such matters as salaries, fringe benefits, working conditions, and educational policy. Prior to collective bargaining policy in public schools was made unilaterally by school administrators subject only to the requirement that the district attract and maintain a qualified staff of teachers. School district decision making was responsive to new teachers and to those able and willing to leave the district when they were dissatisfied with the wage and working condition package offered by the district.

Collective bargaining has changed this by legally giving teachers the right to voice their concerns about wages and working conditions, rather than expressing their preferences solely through their decisions to stay or leave. Our theory states that resource allocation decisions which affect student achievement will be different to the extent that unions

represent the preferences of a different set of teacher preferences in collective bargaining than were considered by management unilaterally prior to collective bargaining.

The Results

We first examined the relationship between union affiliation and district characteristics. Our theory led us to hypothesize that decisions in unionized districts would reflect the preferences of inframarginal or older more experienced teachers to a greater degree than in non-unionized districts. The data from New York and Michigan confirm this expectation. Turnover is greater in nonunion districts than unionized districts. Unionized districts retain more senior teachers by not hiring as many junior teachers, while nonunion districts release more experienced teachers and replace them with less experienced and less costly teachers. This relationship is particularly pronounced in declining enrollment districts. Unionized districts maintain a larger percentage of teachers relative to the percentage decline in enrollment than do nonunionized districts. This results in larger spending per pupil, larger teacher student ratios, a slightly older and more educated staff, and a slightly higher percentage of the budget spent on instruction in declining enrollment districts than in increasing enrollment districts.

When we examined the contracts of school districts, we found only slight differences according to union affiliation. In both states most districts were unionized. Although there are large variations among the contracts within each state, these variations are not explained by union affiliation. Differences between states are more prevalent. Contracts

negotiated by NEA affiliates in Michigan seem to place more emphasis on job security provisions while contracts negotiated by AFT affiliates in New York seem to emphasize wage and working condition provisions. One explanation for this result is that NEA units are more prevalent in Michigan where enrollments are declining more rapidly than in New York. The emphasis on job security by NEA units, therefore, may be more the result of declining enrollment than union philosophy. This latter interpretation is consistent with the notion that unions represent the preference of inframarginal teachers in a district and teachers in declining enrollment districts are more concerned with keeping their jobs than maximizing their pay.

Whether a district is unionized and the affiliation of the union has only minor effects on resource allocation in school districts, in Michigan unionization raises average salaries and teacher student ratios, but leads to lower salaries and higher teacher student ratios in increasing enrollment districts. In New York NEA affiliates seem to do less well than AFT and nonaffiliated units in terms of salaries and teacher student ratio. The differences are slight, however, and due to the high percentage of districts that are unionized, these differences should not be given much weight.

More interesting results were found when we examined the relationships between the content of contracts and resource allocation in districts. Contract provisions place constraints on the decisions of administrators. They sometimes place limits on the way resources are employed. At other times they require a procedure which increases the cost of employing the procedure. Administrators can avoid the impact or cost of the constraint by substituting away from the constrained input. If teachers cannot be

layed off, for example, administrators can reduce instructional expenditures by laying off aides. The larger the number of provisions in a contract, the less able are administrators to avoid the impact of the contract provision by substituting another provision.

Our analysis proceeded then in two ways. First, we looked in New York at the affect of the number of contract items on the allocation of a district's budget. The number of contract items is a good proxy for the maturity of the bargaining relationship and the power of the union. As expected, we found that as the number of contract items increased budget allocations for instructional expenditures, teacher salaries, and teacher benefits increased and the allocations for administration and "other" expenditures decreased. Teachers, for example, in districts with the maximum number of contract items received average salaries that were $1,855 more than teachers in districts with the minimum number of contract items. Again, these findings are consistent with the notion that collective bargaining constrains the decisions of administrators and also allows teachers to exercise a voice in how resources are to be allocated.

We also found that strong unions, as reflected by the number of contract items negotiated, use their power to increase per pupil spending. Districts with the maximum number of contract items spent $72 more per pupil than did districts with the minimum number of contract items.

The second procedure was to examine the relationship between specific contract items and the allocation of a district's budget. In New York the presence of arbitration and grievance items appear to come at the expense of salary and working condition benefits. Items related to job security, such as staff reduction provisions and recall provisions,

increase funds allocated to instructional expenditures and teacher salaries. The presence of a recall procedure also leads to higher instructional expenditures at the expense of "other" expenditures. District contracts with a provision for dismissing teachers for reasons other than financial allocate more money to administration, presumably because of the higher administrative costs of administering such a procedure.

Finally, the New York analysis reveals that the presence of employee benefit provisions in contracts is related to higher expenditures. Since these benefits are a form of compensation, they are partly offset by a reduction in teachers take-home pay. On average, teachers in districts that provide life insurance receive $708 lower salaries, while teachers in districts that provide health insurance take home salaries that are $1,143 less than teachers in districts without these provisions.

In Michigan, the presence of contract items produced a somewhat different pattern of results. For example, New York districts that had a reduction in force provision in their contracts spent more on salaries per pupil than did districts without the provision. In Michigan the reduction in force provision lowered average salaries but maintained a larger staff per pupil ratio than districts without the provision. As mentioned previously, one explanation for this result is the higher rate of enrollment decline in Michigan than in New York. The presence of the reduction in force provision based on seniority produced an unexpected result in Michigan. While it protected the total teaching staff from lay offs, it did not protect the most senior members. Rather, declining enrollment districts with a reduction in force provision based on seniority were able to replace senior faculty with less experienced

faculty more readily than those without the provision. Another provision eliciting different response in the two states is the teacher preparation provision. In New York it was not related to variations in resource allocation. In Michigan teachers in districts with the provision received lower salaries than those without it.

Other relationships between contract provisions and resource allocation are reported in chapters four and five of the report. Contrary to much conventional wisdom, we found that collective bargaining provisions do make a difference in the way districts allocate their resources among important budget categories. In Michigan unions are able to negotiate provisions that provide benefits to teachers, but usually only by making concessions on other items. To gain job security by a reduction in force procedure requires that they accept a lower salary. In New York union negotiators seem better able to provide benefits for their members without compromising other benefits. This general difference, again, may result from a more favorable enrollment and financial environment in New York than in Michigan, or from differences in the legal enrivonment in which negotiations are carried out in the two states.

In New York we were able to investigate the impact of collective bargaining on the propensity of teachers to quit. Our model led us to expect that collective bargaining would provide an alternative to quitting, the option of voicing dissatisfaction and negotiating provisions to respond to teachers' concerns. Reducing teacher turnover is important because it is costly to recruit and retrain teachers. The analysis reveals that the presence of a reduction in force clause based on seniority reduced the quit rate of more experienced teachers but increased the propensity to quit of less experienced teachers. It also

shows that teachers hired to replace those who leave are younger and more highly educated than their predecessors. In other words, districts with larger turnover either as a result of declining enrollment or the union's failure to protect its members, may be building a more qualified teaching staff which could result in greater student achievement.

To examine the effects of collective bargaining on student achievement, we looked at the impact of collective bargaining on those attributes of teachers that have been shown to affect student achievement. We also examined the union's role in eliciting a productive behavioral response from teachers. In New York results are somewhat complex and not very strong. Districts with the class size provision are more inclined to use a traditional classroom organization which tends to reduce the dispersion of test scores within the district. Teacher preparation provisions also reduce the dispersion of test scores through their effect on the traditional classroom mode of instruction. Educational policy committee provisions are associated with lower mean test scores and a greater dispersion of test scores because they tend to be related to the use of cluster classroom arrangements. Whether lower test scores are the result of cluster arrangement which requires educational policy committees, or as we have suggested, policy committees which tend to prefer a cluster arrangement, are still unclear. Finally, we find that districts with more than the average number of contract items employ teachers with more advanced education, which in New York is related to higher test scores. In other words, test scores are affected by specific provisions which are related to productive teacher attributes, as well as by the number of provisions which interact with teacher attributes related to higher student achievement.

We were able to find only a few contract items which affected the productivity of teacher attributes. We find that declining enrollment districts that include a teacher evaluation provision have lower mean scores and more disperse test scores than declining enrollment districts without the provision. This holds true for both the influence of teacher experience and educational level on test scores. This result is intuitively satisfying since we would expect a teacher evaluation procedure to create some anxiety in districts faced with the prospects of lay offs. The presence of a teacher aide provision increases mean test scores and reduces their dispersion. The effect is greatest in districts with declining enrollment. This result is expected since aides relieve teachers of tasks which detract from the time available for direct instruction.

Conclusion

In Chapter 2 we noted that collective bargaining gives teachers a voice in decision making at the district level. The effects of "voice" are reflected in the provisions contained in contracts which act to constrain the decisions of management. Voice may also improve the performance of schools by giving teachers a greater stake in the negotiated decisions of the district and indirectly by making them feel more involved in the decision making process. Our study shows that collective bargaining changes the allocation of district resources usually in ways that are perceived to be beneficial to teachers. Collective bargaining also reduces teacher turnover and seems to encourage the entry of more qualified teachers when replacements are required. Finally, we present some evidence to show that certain provisions may increase the productivity of teacher attributes which are related to higher test scores.

The evidence presented here on the role of unions in public schools is limited by both the available data and the method of analysis. The analysis is well suited to explain the impact of collective bargaining on the allocation of resources, and indeed the results are very insightful. The link between inputs and student outcomes, however, is less satisfactory. Even though our approach reflects the state of the art in education production functions, the present technology does not reveal the subtle differences in individual teacher and student behavior required in a study such as ours.

Many of the linkages explored in this study need to be examined at the classroom or even the individual student level. Many of the problems of relating behaviors at the district level, such as the negotiation of collective bargaining contract and the transfer of knowledge in the classroom to individual students, have not been adequately solved here. Much larger data sets collected at the student level over a protracted period may be necessary to fully answer the questions we have only begun to explore. We do feel that our study has taken a necessary and substantial step in beginning to understand the relationships between unions and public education.

Appendix A

THE STRUCTURE OF TEACHER CONTRACTS AND ESTIMATION BIAS

Introduction

The formal model of the impact of contract items on resource allocation requires that all contract items be entered into the demand equation simultaneously. We have chosen, however, in the analysis to enter each contract item separately into the demand equation. We have taken this course primarily to facilitate the already extensive analysis and to simplify the interpretation of the results. In adopting this approach, we run the risk of introducing certain biases into the estimation. However, an extensive investigation of the extent of the bias reveals that our approach results in very little estimation bias. This appendix reports on the results of this investigation. The content of this appendix goes beyond the problem of estimation bias and, in addition, considers the overall structure of teacher contracts. We show that estimation bias and the structure of contracts are closely related and, thus, in addressing one problem the other has to be considered as well.

Teacher contracts are complex and varied. Casual observation of the percentages of districts with the various items listed in Chapters 4 and 5 indicates that the composition of contracts vary widely. A large part of the variation between contracts is due to the dynamics of the bargaining process. Bargaining is an incremental progress. Gradually, as districts negotiate new contracts, more and more provisions are included in the contracts. In the one year period between 1976 and 1977 some Michigan school districts negotiated as many as ten new contract provisions, while for the same

period, other districts negotiated no new provisions. The number of new items entered into a contract, and consequently the status of the contract depends upon several factors; among them are: 1) the needs of the teachers, 2) the financial position of the school district, and 3) the history of past negotiations. For example, teachers in school districts which face declining enrollments and an eroding financial base may seek provisions which insure job security and a reasonable increase in salaries. Administrators, on the other hand, may reject such provisions for financial reasons. Districts which do not face such hardships may concentrate their bargaining efforts on other areas such as educational policy and inservice programs. The contracts of these two districts will reflect their current conditions.

Teacher contracts reflect the history of collective bargaining in districts since items once agreed upon are seldom deleted in subsequent negotiations. Districts which have always faced hard times have never had the chance to negotiate educational policy items and thus their contracts are devoid of such provisions.

Negotiations not only add to the scope of the contract; they also add to the breadth. The major categorical headings of Table A-1 demonstrate the notion of breadth. Each category contains a number of closely related items. For instance, the four items included under class size are directed at controlling the number of students the teacher must face in the classroom. However, not all items effect class size equally, nor are they independent of one another. For example, items describing alternatives to class size relief will not be present unless there is a provision to limit class size. Thus, the first item will not be present in a contract without the second.

On the other hand, districts which obtained only a class size limitation provision without any provision of relief alternatives will probably be observed to have less impact on the class size than those districts with both provisions. The same is true for the other categories of items listed in Table A-1.

Estimation Biases Due to Multiple Contract Items

The inclusion of all relevant contract items into the demand equations opens the analysis to a number of estimation bias problems. Two problems will be addressed. The first is the problem of irrelevant variables, and concomitantly, the problem of omission of relevant variables. The second problem concerns simultaneity bias and will be discussed later.

The introduction of irrelevant variables into the regression equation lowers the prevision of the estimates while the omission of relevant variables increases the precision but biases the estimate.

The problem of irrelevant variables and leftout variables can be illustrated by considering a simplified version of the resource allocation model in which the education input (y) is a function of two contract items, x_1 and x_2 where:

$$y_t = \beta_1 x_{1t} + \beta_2 x_{2t} + \varepsilon_t \qquad \text{(A-1)}$$

We will assume for purposes of argument that this equation constitutes the true relationship. No other variables are needed to describe the relationship. However, by entering only one contract item, say x_1, we have instead estimated the equation

$$y_t = \beta_2 x_{2t} + \varepsilon_t \qquad \text{(A-2)}$$

Table A-1: The Percentage of Districts With Contract Provisions in Each Category

	Percent of Districts With Contract Item
Planning Time	
--high school teachers have at least one period preparation time (104)	66
--elementary teachers granted at least 30 minutes preparation time (102)	37
--elementary teachers use specialist time (106)	39
--duty free lunch (109)	67
Class Size	
--class size is limited (36)	49
--class size relief: add teachers (37)	07
--class size relief: add aides (38)	19
--aides relieve teachers of non-professional duties (69)	21
Job Security	
--staff reduction based on seniority (30)	72
--staff reduction based on certification (31)	69
--staff reduction is grievable (33)	65
--recall based on inverse order of reduction (34)	60
Union Strength	
--payment of dues (9)	57
--enforcement procedures for agency shop (12)	57
--release time for officers (18)	08
--bargaining includes chairperson (8)	64
--bargaining includes substitutes (4)	42

The bias depends on two terms, namely the regression coefficient of the left out variable in the true relation (β_1) and the comovements of the left out variable with the individual variables. When a variable from the true relation is left out, a part of its influence in explaining the movements of the dependent variables is captured by the other independent variables. The independent variable with a larger partial relation to the left out variable will have a larger bias.

Suppose that the two contract items are positively correlated as would be the case in a hierarchical structure, then if one of the items is omitted and the true coefficient of the left out variable is significant, the expected value of the estimate will be higher than the true value. A negative correlation results in the expected value of the estimate falling below the true value. In either case, the variance of the single item coefficient estimate is lower when the other contract item is left out but is correlated. Consequently, items which appear to be significant in the single item estimation may not be when additional items are entered into the regression equation.

Since there is a tradeoff between bias and precision of the estimates, the researcher must choose between reducing bias or increasing precision. If the lack of bias is not a prime consideration, then the possibility of bias resulting from omission of relevant variables will be disregarded and only one contract item will be entered. Since we are concerned more with the direction of the impact of the contract item than with the magnitude, bias is not as critical as the precision in the estimates. We therefore adopt the approach that would bring about the greatest precision.

We have tested to see the extent of the bias in the estimates as a result of entering only one contract item into each demand equation. The estimates displayed in Tables A-2A&B are obtained from entering all contract items simultaneously and individually. We find that in general, the bias introduced in the single contract equation is very small and will not affect the analysis significantly.

Even though we are confident that little bias will be introduced into the estimation by including only one contract item in the equation at a time, it is interesting to see why this is the case. Bias is introduced when a variable included in the regression captures part of the variation of the omitted variable. This would not happen if the omitted variable were present. Suppose, however, that a hierarchy exists within the contract items. Contracts that contain item 2, for example, would also contain item 1, and contracts which contain item 3, also contain 1 and 2, and so forth. Thus, the variation of item 1 is already embodied in item 2, and the variation of items 1 and 2 in item 3. Therefore, the omission of item 1 when item 2 is present in the equation will not result in a different estimate from when both items are entered simultaneously. Estimation bias, however, will arise if the hierarchy is not perfect. The question to be addressed is the nature of the structure of contracts. Guttman Scale Analysis will be used to investigate the hierarchy of contracts.

Guttman Scale Technique

Contracts can be characterized by two dimensions: scope and breadth. The scope refers to the number of major areas of educational policy at which

Table A-2A: Imput of Contract Items on New York School Districts When All Items are Entered Simultaneously, 1976-1977

		Inst Exp/ Pupil	% Masters or Greater	Average Teaching Experience	T/S	Ave Sal
Final Stage Binding Arbitration	9	-.018 (1.88)	-.003 (.12)	-.052 (1.87)	-.015 (1.21)	-.011 (.55)
Evaluation Procedure	38	-.008 (.83)	-.017 (.75)	-.042 (.65)	-.006 (.44)	-.015 (.74)
Maintenance of Standards	30	.009 (.82)	.024 (.98)	-.077 (1.13)	-.008 (.57)	.011 (.52)
Staff Reducation Procedure	55	.013 (1.73)	.026 (1.53)	-0.19 (.40)	.004 (.43)	.028 (1.85)
Recall to Position	58	.003 (.24)	-.018 (.70)	-.048 (.64)	-.008 (.55)	.015 (.65)
Seniority Clause	57	.016 (1.75)	-.0007 (.03)	-.084 (1.52)	.014 (1.25)	.018 (1.02)
No Reduction During Contract	56	.004 (.24)	.050 (1.31)	-.102 (.95)	-.029 (1.36)	.047 (1.36)
Applies to Tenured Only	61	-.041 (1.14)	.001 (.01)	-.041 (.18)	.037 (.82)	-.048 (.67)
Dismissal for Just Cause for Non-Tenure	59	.034 (.98)	-.021 (.27)	.014 (.06)	-.026 (.60)	.032 (.46)
Applies to Probationary Teachers Only	60	.003 (.23)	.005 (.12)	.063 (.86)	.002 (.13)	.015 (.62)
Severance Pay Provision	62	-.058 (2.74)	.010 (.22)	-.102 (.77)	-.005 (.18)	.051 (1.21)
Class Size Provision	40	-.0006 (.09)	.021 (1.42)	.004 (.09)	-.009 (1.05)	.003 (.23)
Teacher Preparation Provision	53	-.009 (1.18)	.022 (1.30)	.010 (.22)	.005 (.51)	-.017 (1.07)
Educational Policy Committee	44	-.003 (.40)	-.007 (.47)	.053 (1.23)	-.013 (1.53)	-.007 (.52)
Tuition Reimbursement	42	.031 (1.86)	-.011 (.32)	.082 (.77)	.029 (1.39)	.033 (.98)
Inservice Provision	20	.003 (.51)	-.014 (.93)	-.053 (1.24)	.006 (.73)	.009 (.69)
Summer Sabbatical	6	.006 (.65)	.021 (1.04)	.033 (.56)	-.002 (.18)	.010 (.51)
Number of Aides Specified	19	.022 (.95)	-.017 (.31)	-.109 (.74)	-.011 (.37)	.022 (.46)

Table A-2B: Impact of Contract Items on New York School Districts When Items are Entered Individually

		Inst Exp/ Pupil	% Masters or Greater	Average Teaching Experience	T/S	Ave Sal
Final State Binding Arbitration	9	-.015 (1.62)	-.002 (.10)	-.072 (1.24)	-.012 (1.09)	-.004 (.22)
Evaluation Procedure	38	-.010 (.96)	-.012 (.56)	-.060 (.98)	.0005 (.04)	-.013 (.66)
Maintenance of Standards	30	.008 (.72)	.027 (1.17)	-.054 (.82)	-.007 (.56)	.009 (.40)
Staff Reducation Procedure	55	.016 (2.37)	.023 (1.55)	-.04 (1.09)	.004 (.42)	.035 (2.56)
Recall to Position	58	.017 (1.59)	.004 (.17)	-.094 (1.47)	-.003 (.20)	.041 (1.96)
Seniority Clause	57	.018 (2.11)	-.002 (.11)	-.108 (2.09)	.014 (1.36)	.027 (1.64)
No Reduction During Contract	51	.001 (.08)	.055 (1.47)	-.109 (1.04)	-.033 (1.56)	.050 (1.46)
Applies to Tenured Only	61	-.003 (.41)	-.016 (1.05)	.010 (.23)	.009 (1.11)	-.000003 (0.00)
Dismissal for Just Cause for Non-Tenure	59	-.001 (.17)	-.016 (1.10)	-.012 (.29)	.008 (.99)	.002 (.13)
Applies to Probationary Teachers Only	60	-.001 (.18)	-.010 (.61)	.012 (.28)	.008 (.86)	.006 (.39)
Severance Pay Provision	62	.053 (2.56)	.010 (.23)	-.125 (.98)	-.012 (.45)	.057 (1.37)
Class Size Provision	40	-.002 (.36)	.024 (1.63)	-.011 (.27)	-.009 (1.03)	.002 (.18)
Teacher Preparation Provision	33	-.008 (1.11)	.028 (1.69)	-.003 (.07)	.002 (.24)	-.012 (.80)
Educational Policy Committee	44	-.003 (.52)	-.005 (.34)	.049 (1.19)	-.013 (1.59)	-.008 (.63)
Tuition Reimbursement	42	.030 (1.82)	-.008 (.22)	.088 (.86)	.031 (1.51)	.033 (.99)
Inservice Provision	20	.001 (.18)	-.016 (1.08)	-.055 (1.33)	.007 (.91)	.005 (.41)
Summer Sabbaticals	61	.004 (.45)	.015 (.73)	.021 (.36)	-.005 (.44)	.007 (.40)
Number of Aides Specified	19	.018 (.77)	-.029 (.56)	-.066 (.45)	-.005 (.17)	.010 (.20)

the various contract items are targeted. In Michigan, for example, we have identified three major areas or domains: labor jurisprudence, working conditions and union strength. In order to facilitate the use of the Guttman analysis, we will further divide working conditions into class size related provisions and planning time provisions.

Each group contains a variety of separate items all dealing in differing degrees with the major purpose of the group. The number of items within each group constitutes the breadth of the contract. For instance the domain labeled class size contains provisions limiting the number of students in the class room. Additional provisions outline specific methods of class reduction. Finally, provisions are made for teachers faced with over-crowded classes to receive penalty payments and collective support from the association.

Theoretically 16 $\binom{4}{2}$ possible combinations of the four items in the class size domain could be observed. However, it is obvious that not all combinations will exist. From the example above, it would be highly unlikely that an item to relieve class size would be present in a contract without the presence of the class size limitation provision. Therefore a number of the permutations can be ruled out. Indeed, it would be senseless to enter all four items as explanatory variables into a regression equation since the results would make little sense.

We need, instead, to identify those combinations of items which actually coexist in contracts and to decipher the logic embodied in the patterns. The Guttman scaling technique can accomplish both tasks. First, the Guttman technique identifies the combinations of items present in the data. Second, the actual permutations are described in a hierarchical structure.

Guttman scales determine the underlying structural characteristics of three or more items which meet two basic properties. First, Guttman scales are unidimensional, that is, the component items must all measure toward or away from the same single underlying principle. Second, Guttman scales are cumulative which implies that the component items can be ordered by degree of difficulty. It follows, therefore, that respondents who reply positively to a difficult item will always respond positively to less difficult items and vice versa. In the case of contract items, districts which are able to obtain items which are very difficult to negotiate are also expected to obtain items which are less difficult.

The incremental process of contract negotiations and the cumulative principal upon which Guttman scales are constructed allows the hierarchy obtained from the Guttman analysis to be interpreted as the result of a dynamic process. Suppose that all school districts face similar financial conditions and teachers share similar preferences. Contract items which are the most difficult to negotiate are most likely those which have not been negotiated extensively in other districts. The most easily negotiated items are the most widely accepted items. Therefore, the hierarchy obtained from the Guttman analysis can be interpreted in terms of the chronology of the acceptance of certain contract items. The item at the base of the hierarchy is the first to be negotiated and over time has gained acceptance while the item at the top is the pathbreaking item which has little precedence to rely on as justification for acceptance. Over time, the top item will probably move down the hierarchy to be replaced by new path-breaking items.

The Guttman technique can best be described as a probabilistic process. The probability of observing a response pattern, say $(10101)^i$, on a 5-item Guttman scale is the summation of six items: the probability of finding a district of type (00000) which has a configuration (10101), the probability of finding a district of type (00001) which gives response (10101), ... , the probability of finding a district of type (11111) which has configuration (10101). The six types (00000), (00001), ..., (11111) represent the true hierarchical response patterns. Notice that once the item to the extreme right is present, it appears in all other remaining configurations. This is what is meant by the cumulative principle and obviously the right-most items are more common than the left-most items and are considered to be the least difficult to obtain. On the other hand, when an item to the left is obtained, all items to the right of it are assumed to be obtained.

Obviously, not all districts will have contracts which exactly duplicate the true response patterns. The problem is to find the particular hierarchy among the 5 items which minimizes the probability of obtaining a false response. If $\theta_1, \theta_2, \ldots, \theta_6$ are taken to be the proportions of the true types in the population of districts and ∂ stands for the chance of an incorrect response, then the probability of observing the pattern (10101) is:

$$\text{(A-3)} \quad \Pr(10101) = \alpha^3(1-\alpha)^2\theta_1 + \alpha^2(1-\alpha)^3\theta_2 + \alpha^3(1-\alpha)^2\theta_3 + \alpha^2(1-\alpha)^3\theta_4 + \alpha^3(1-\alpha)^2\theta_5 + \alpha^2(1-\alpha)^3\theta_6$$

The exponent of α in each term is the number of modifications in the true Guttman response patterns that are required to produce the observed pattern. Assuming that the frequencies of the observed response patterns for a sample of districts are distributed multinomially with probabilities given by the formula {A-3}, maximum likelihood methods can be used to derive the hierarchy that minimized the response errors.

Guttman Scale Analysis

The Guttman scales for the various contract domains are listed in Table A-3. Consider the scale for job security. Four contract items constitute the scale with the most common item (the least difficult) being the limitation provision (item 30) and the least common (the most difficult) being consultation with the association (item 34). A perfect response of the districts to this hierarchy would result in the presence of only the true response patterns. Table A-4 gives an example of the response patterns that are observed. Notice that the overwhelming majority of responses of the districts comply with the true patterns. However, a few are error responses. Two statistics are important to determine whether the observed responses comply with the hierarchical structure of the Guttman scale. The first is the coefficient of reproductability where the accepted rule of thumb for a good fit is a value .92 and above. The second, and more precise statistic, is the chi-square statistics of the maximum likelihood estimates.

Table A-3: Guttman Scale Ordering of Contract Items for Michigan School Districts

	Most Difficult			Least Difficult		Coefficient of* Reproducibility	Chi-Squared
Planning Time	102	106		104	109	.87	213.67
Class Size	37	38		69	36	.91	148.66
Job Secruity	34	33		31	30	.94	65.63
Union Strength	18	4	12	9	8	.90	400.02

*Note: Coefficient of reproducibility is a manner of the extent to which a respondent's scale score products one's response patterns.

It is equal to $1 - \frac{\text{Total Errors}}{\text{Total Response}}$

Table A-4: Response Pattern of Planning Time Contract Items for Michigan School Districts, 1976

Contract Item Number				Number of Observed Responses	Hierarchy Level
102	106	104	109		
0	0	0	0*	143	0
0	0	0	1*	28	0
0	0	1	0	15	0
0	0	1	1*	64	2
0	1	0	0	0	0
0	1	0	1	16	3
0	1	1	0	8	3
0	1	1	1*	93	3
1	0	0	0	3	0
1	0	0	1	4	0
1	0	1	0	13	0
1	0	1	1	83	4
1	1	0	0	0	0
1	1	0	1	4	4
1	1	1	0	7	4
1	1	1	1*	123	4

(*'s denote true Guttman response)

Since the various levels of the Guttman scale represent degrees of intensity and complexity of the union contracts, the hypothesis to be tested is whether the level effects the intensity and significance of the impact of contracts on resource allocation and teacher effectiveness. In order to test the hypothesis, each level of the hierarchy is entered into the regression as a dichotomous variable. The dichotomous variable method is chosen over the use of a continuous measure such as assigning integers in ascending magnitude to each level. The integer method assigns a priori weights to the various levels whereas the dichotomous method allows the data to reflect the intensity of the impact at each level without imposing a priori restrictions on the estimation. The coefficient of each dummy variable represents the mean effect at each level of the score. When plotted against the levels of the hierarchy, various configurations are possible. In the case of a positive influence of the contract items on the dependent variable, an increase in the level of the hierarchy may produce a slope that increases either at an increasing, constant, or decreasing rate. The same will hold true for a negative slope.

The values of the coefficients associated with each level of the Guttman scale are displayed in Table A-5. Before these values can be interpreted, it is first necessary to review briefly the use of dummy variables. A dummy variable, or dichotomous variable, is entered into the equation for each level of the Guttman scale in order to record the marginal effects on resource allocation of each level of the scale. For purposes of illustration, consider the job security category. Four items comprise the Guttman scale, but since some districts may not possess any of the four items, we include a fifth level to record the absence of all

contract items. All districts which possess none of the items will be placed in the first level of the Guttman scale and assigned a 1 to the dummy variable associated with this level. All districts which possess contract item 30, but no others, (assuming a perfect fit of the data to the Guttman scale) will be assigned a value of 1 to the second dummy variable and a 0 to the first dummy variable. Districts will be assigned a value of 1 to the third dummy variable if they have both items 30 and 33, but no others. After assigning the appropriate values to the fourth and fifth dummy variables, we have a matrix of the form:

obs.	D1	D2	D3	D4	D5	Guttman Scale Level
1	1	0	0	0	0	1
2	1	0	0	0	0	1
3	0	0	1	0	0	3
4	0	1	0	0	0	2
5	0	0	0	0	1	5
.	.	.	.	.	.	.
.	.	.	.	.	.	.
.	.	.	.	.	.	.

Notice that no district is assigned a value of 1 to more than one dummy variable. Also, notice that if all dummy variables are included in the regression equation along with an intercept term, perfect collinearity will result and estimation is impossible. This can be avoided by deleting any one of the dummy variables (or the intercept term). We elect to delete the first dummy variable since it represents those school districts which have no contract items and thus this level is not expected to have any impact on resource allocation.

The impact of a particular Guttman level on the allocation of resources can be measured by looking at the difference between the first level dummy variable (or in our case, the intercept term) and the particular level of

of interest. A simple illustration will help clarify this point. Consider the equation in which the level of educational inputs (R) is determined by the five levels of the Guttman Scale and other explanatory variables summarized by Z. That is,

(A-4)

$$R = \alpha_1 + \alpha_2 D_2 + \alpha_3 D_3 + \alpha_4 D_4 + \alpha_5 D_5 + \alpha_6 Z + \varepsilon$$

The expectation of R subject to the presence of the second level $E(R|D_2 = 1)$, is equal to the intercept term α_1 plus the coefficient of D_2. The coefficient of D_2, alone, and the corresponding t-ratio, test whether there is any significant difference between districts which are at the first level of the Guttman Scale and those which are at the second level; that is the coefficient indicates whether the level of the Guttman Scale and consequently the combination of contract items represented by that level, has any significant effect on the allocation of educational inputs.

Upon examining the results in Table A-5, we see that the signs of the estimates are in the same direction as the signs of the coefficients of the individual contract items. This is reassuring because it indicates that the overall structure of the contract affects the allocation of resources in much the same way as the individual contract items do when considered separately.

Thus, we conclude that the use of individual contract items entered separately into the regression equation does not bias the estimates significantly.

Table A-5: Impact of Guttman Scales on the Allocation of Educational Inputs for All Michigan School Districts, 1976

		Inst Exp	Exp	Masters	Av Sal	T/S	T
PLANNING TIME	2					.014 (1.49)	.12* (1.73)
	3				-.016 (1.46)		
	4		-.06** (2.03)		-.02* (2.47)		
CLASS SIZE	1		-.04 (1.47)			-.02** (2.01)	
	2						
	3						
	4		-.09* (1.90)				.14 (1.44)
SECURITY	2					.03 (1.47)	
	3						
	4						
	.		-.04 (1.56)		-.02* (1.77)		
STRENGTH	1				-.023 (1.49)		
	2		-.05 (2.11)**			-.013* (1.7)	.10 (2.08)
	3		-.069 (1.62)			-.04 (3.1)***	.19** (2.38)

* .10 significance level
** .05 significance level
*** .01 significance level
dependent variables entered in log form
( ) T-ratios
0-4 denote levels of the Guttman scale in ascending order

Simultaneity Bias

A major problem with interpreting the results of the previous analysis is the concern with the direction of the causation. The hypothesis presently embodied in the analysis is that contract items influence the level and changes in resources. The possibility that the level and changes in educational resources determine the inclusion of items in the contracts has yet to be considered.

In order to illustrate the problem of simultaneity, consider the simple example in which the contract item Q plus selected other variables summarized by Z influences the level of resources Y while at the same time the level of resources plus perhaps parent preferences X affect Q. This relationship can be summarized in the two equation system.

(A-5) $$Y_i = \alpha_o + \alpha_1 Q_i + \alpha_2 Z_i + \varepsilon_{1i}$$

(A-6) $$Q_i = \beta_o + \beta_1 Y_i + \beta_2 X_i + \varepsilon_{2i}$$

If the coefficients of equation (A-5) are estimated by ordinary least squares (OLS) which ignores the presence of equation (A-6) and the coefficients in (A-6) meet certain conditions, the estimates could be biased. Intuitively, the bias results from the fact that the influence of contract items on resources is inadvertently given the "credit" for the effect of resources on contract items. If we expect items to have a positive effect on resources and resources to have a positive effect on contract items, then the bias on α_1 will be upward.

More formally, it can readily be shown that

(A-7)

$$P_{lim}\ (\hat{\alpha}_1-\alpha_1) = \frac{1}{(1-\alpha_1\beta_1)\Delta}\ [\beta_1 var(\varepsilon_1)+cov(\varepsilon_1,\varepsilon_2)]$$

where Δ is the determinant of a positive definite matrix ($\Delta > 0$). In order for the bias to vanish, both β_1 and cov (ε_1, ε_2) must equal 0. If this is not the case, two estimation techniques can be employed to correct the bias. The two stage least squares (2 SLS) technique takes into account the endogenous nature of the contract items, that is, the possibility that $\beta_1 \neq 0$. The first stage of the two stage estimation process is the OLS estimate of equation (A-6). In the second stage the predicted value of the contract item is entered as an explanatory variable into the first equation which in turn is estimated by OLS. The result is a consistent estimate of β_1.

The two stage least squares technique assumes that the error terms of the two equations are not correlated. If they are indeed correlated, then the three stage (3 SLS) procedure is needed. The 3 SLS procedure can be shown to yield more efficient parameter estimates than 2 SLS because it takes into account the cross-equation correlation.[2] Even if $\beta_1 \neq 0$, the use of 3 SLS is still appropriate.[3]

Before describing the estimates derived from 2 SLS and 3 SLS, a brief statement should be made about the jointness of the contract items and educational inputs. The negotiation of contracts is based on the preferences of teachers and administrators as they presently face student bodies, parental pressures, and financial conditions and equally important as they anticipate future conditions. Pascal and McDonnell find that the presence of various

contract items are not readily explained by selected measures of current conditions.[4] Our findings, although exhibiting a little more significance, support their general conclusions. Griliches, in discussion of a similar problem, suggests that the extent to which endogeneity is a serious problem depends on one's views as to how close teachers and administrators are able to guess their own and the district's future and to what extent their actions can be interpreted as optimizing.[5] One indication of the lack of ex-ante optimizing behavior is the low R^2s observed for a number of the regression equations which explain the presence of contract items. This insight into the problem of endogeneity is offered more as a tool for interpreting the results than for performing the actual analysis.

The implementation of the 2 SLS and 3 SLS procedures in our particular case requires statistical routines that are available only for limited special cases.[6] The problem is that one of the dependent variables, the contract items, is a dichotomous variable and the routines that are available to this project can only accommodate continuous dependent variables.

One solution to the problem is to transform the 0-1 measure of the contract items into a continuous index. Pascal and McDonnell suggest an index that is suitable for our study. Two assumptions are made in constructing the scale which are very close to the assumption implicit in the Guttman Scaling. In fact, simple correlation analysis reveals that the two scales are highly correlated.[7] First we assume that the more complete the contract (i.e., the presence of more items within each category) the more effective the contract. Second, we assume that a contract which possesses an item with a very low sample mean is much more impressive than a contract which is typical. In order to capture both of these properties, a district's contract is compared with the sample

means of each contract item by subtracting the district's value ("1" if item is present, "0" if silent) from the sample mean. For example, suppose that 70 percent of the districts have a contract item which limits class size. A district with the item will receive a score of 0.3 (1-0.7) while a district lacking this provision will record a score of -0.7 (0.0-0.7). Thus, a district which differs substantially from the norm will receive a higher weight, either positive or negative. Finally, the scores of each contract item are summed over all items within each category and divided by the corresponding number of contract items. Table A-6 displays the high and low scores for the seven categories. It is easily seen that the value of the index approximates very closely the level of the Guttman Scale. Items which are high on the Guttman Scale have low frequencies, and thus districts with such an item will have a higher score.

Table A-6

Scores for Major Contract Headings (high, low) for Michigan Suburban School Districts, 1976-77

High	Low
.53	-.47
.73	-.28
.73	-.28
.64	-.36
.67	-.33
.70	-.30
.29	-.71

The scores enter the regression equations as both explanatory and dependent variables. Since both dependent variables in equation (A-5) and (A-6) are continuous, the standard 2 SLS and 3 SLS procedures can be used. We will concentrate on the 2 SLS estimates displayed in Table A-7 since our primary concern is whether the jointness of the contract items and educational inputs effects the OLS estimates. Comparison of the OLS and 2 SLS estimates reveals that the inclusion of endogenous contract variables into the regression does not alter significantly the value of the estimates. The use of 2 SLS does, however, improve the precision of a number of estimates which, when estimated only by OLS, went unnoticed. It appears, therefore, that the simultaneity bias is not very severe and the use of 2 SLS serves primarily to improve the precision of a few estimates.

Simultaneity not only affects the bias and the precision of the estimates but also the interpretation of the direction of causation. We have postulated that contract items affect resource allocation, and indeed we have found this to be true. However, 2 SLS also reveals that in many instances the level of educational inputs affects the presence of items in district contracts. For example, the results displayed in Table A-7 show that suburban school districts with higher than average level of instructional expenses per pupil have a greater number of contract items within the class size, job security, and union strength categories. On the other hand, suburban districts with higher than average salaries have fewer contract items in the planning time and job security categories. The size of the teaching staff is also shown to have a significant effect on the number of contract items.

Table A-7: OLS and 2 SLS Estimates of Impact of Aggregate Contracts on Resource Allocation and Impact of Resource Allocation on Contract Measures for Districts in Michigan Suburbs, 1976

	Inst Exp	Exp	Masters	Av Sal	T/S	T	FB
OLS							
Planning time			-7.34 (2.45)**	-1171 (295.95)**	.002 (.0008)**	13.16 (5.06)**	
Class size		-1.26 (.60)*	-7.24 (3.02)**	-952.79 (373.86)**			.02 (.01)**
Job security			-6.79 (2.19)**	-950.19 (268.78)**	.002 (.0008)**	12.89 (4.51)**	
Union strength	-26.24 (12.32)*	-1.0 (.50)*	-6.50 (2.52)**	-774.71 (313.25)**		9.17 (5.24)*	
2 SLS							
Planning time		-.885** (.49)	-7.32 (2.51)**	-1212 (301.28)**	.002 (.0008)**	13.93 (5.16)**	
Class size		-1.29 (.59)**	-7.28 (3.28)**	-940 (380.47)**			.02 (.01)**
Job security		-.82 (.44)*	-6.85 (2.24)**	-953.8 (274.02)**	.002 (.0007)**	13.15 (4.60)**	
Union strength	-22.18 (12.58)*	-1.05 (.51)*	-6.57 (2.62)**	-824.0 (323.37)**		10.56 (5.41)*	

Effect of Resources on Contract Items

Planning time		.22 (.08)**		-.0004 (.0001)**		.01 (.003)**	-7.36 (3.52)**
Class size	.001 (.0004)*	.21 (.09)**				.01 (.003)*	9.06 (2.86)**
Job security	.001 (.0006)*	.21 (.09)**		-.0004 (.0001)**	45.97 (23.27)**	.01 (.004)**	
Union strength	.001 (.0005)*					.01 (.004)**	

(Standard errors in parentheses)
* Denotes .10 significance level
** Denotes .05 significance level

A number of conclusions can be drawn from this analysis. First, even though contract items are not entirely exogenous to the system, analysis based on the assumption that they are exogenous (i.e., OLS) does not appear to bias the estimates significantly. Second, and related to the first point, the effect of educational resources on the presence of contract items does not cause statistically significant estimates to appear when resources are regressed on contract items. In other words, the reverse causation does not cause a misinterpretation of the estimates. Third, in a number of cases, resource allocation influences the presence of contract items even though the contract item coefficient is not statistically significant in the resource regression. Thus, it may be useful, at times, to consider the impact of resources on contract item to reconcile otherwise curious findings.

Footnotes - Appendix A

1. The "1" in the first column indicates the presence of the first contract item; the "0" in the second column indicates the absence of the second contract item, and so forth. The problem is to find out which items fall into which columns.

2. This procedure is more complicated than 2SLS and the reader is directed to a standard econometric book such as Pindyek and Rubinfeld for an explanation.

3. This is analyogous to "Zellner's Seemingly Unrelated Equations Technique," (See A. Zellner, "An Efficient Method of Estimating Seemingly Unrelated Regressions and Tests for Aggregation Bias," Journal of the American Statistical Association, Vol. 57, 1962, pp 348-68.

4. Lorraine McDonnell and Anthony Pascal, Organized Teachers in American Schools, (Santa Monica, California: Rand, 1979).

5. See Zi Griliches, "Estimating the Returns to Schooling: Some Econometric Problems," Econometrica, Vol. 45, No. 1, (January, 1977), p. 13.

6. Schmidt and Strauss have extended the procedure to include 3SLS but the use of their program is not available at this time. See Peter Schmidt and Robert P. Strauss, "The Effect of Unions on Earnings and Earnings on Unions: A Mixed Logit Approach," International Economics Review, Vol. 17, No. 1, (Feburary, 1976), pp 204-212.

7. A simple but very accurate way of checking the similarity between the Guttman scales and the Pascal-McDonnell index is to regress the index against the levels of the Guttman hierarchy. We find that in every case the fit is very good with all t-ratios significant at the .01 levels and R^2s above .85. The values of the coefficients of the various levels increase in magnitude as we move from the lowest to highest level of the hierarchy. Finally, the relationship between the index and Guttmans appear to be linear with only a few minor exceptions. The exceptions exhibit such minor deviations from the linear form that no functional form other than linear need be included in the regression equations. Therefore, we are very confident in using the continuous index as a substitute for the dichotomous scaling variables. We do, however, caution that we will not be able to discern the individual effects of the various levels of thehierarchy, only the direction of its impact.

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